EXERCISE ADHERENCE IN PERSONS WITH TYPE 2 DIABETES AND RELATIONSHIP TO DIABETES CONTROL

by

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Abstract

The purpose of this pilot study was to examine exercise adherence in persons with Type 2 diabetes and how the stages of change in exercise are related to metabolic control. A sample of 28 persons with Type 2 diabetes in ages ranging from 53 to 77 (16 males and 12 females), was studied using the Transtheoretical Theory of Change. Surveys on the Stages of Change, Processes of Change and Self-Efficacy developed by Marcus, Rossi, Selby, Niaura, & Abrams (1992) were mailed to participants and followed-up with a telephone Stanford 7-day activity recall. Subjects were assigned a stage of exercise adoption (Precomtemplation, Contemplation, Preparation, Action, and Maintenance) based on answers to questions in the mailed survey. Metabolic control was related to stage of exercise adoption. Reported physical activity also were related to stages of change in exercise. The telephone survey was used as an internal validation of the mailed self-report. Processes of change in exercise and self-efficacy also were explored in relation to stages of change.

Distribution among the stages was unusual. Half of the participants fell into the highest stage of exercise adoption (maintenance). Marcus, Rossi, et al. (1992) only found 22% of their sample to be in this stage. Also two of the stages (precontemplation and action) only had one individual and therefore the stages were collapsed into three stages combining precontemplation with contemplation and action with maintenance for many statistical calculations. In addition, for some calculations, the group was divided into exercisers (Stages 1,2,&3) and non-exercisers (Stages 4&5). The most frequent type of exercise reported was walking. Thirty-five percent chose walking alone and an additional 60% who chose walking or treadmill as part of their fitness program.

HgA1C failed to differentiate exercisers from non-exercisers, however a trend was noted. Body Mass Index (BMI) did significantly differentiate between the stages of exercise with the lowest BMI reported in the highest stages ($p \leq 0.003$). Exercisers had significantly lower Cholesterol-HDL ratios than non-exercisers ($p=0.02$). Both the mailed survey and telephone survey of reported days of exercise per

week correlated with stage of exercise adoption ($p<0.01$) and the days of exercise per week as reported in the telephone survey significantly differentiated the stages of exercise adoption ($p=0.005$).

Self-efficacy failed to differentiate the stages and only one of the ten processes of change (counterconditioning) significantly differentiated the highest stages from the lowest stages. When T-tests, using pooled variances to adjust for differences in sample sizes were accomplished using this data set and that of Marcus, Rossi et al. (1992), no significant differences were found between the processes of change used in each stage of exercise.

Although this study showed promising trends, additional study is required to obtain a larger sample size and determine intervention strategies to promote exercise adherence and prevent relapse.

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Introduction

Problem and Significance

Exercise plays a very important part in the treatment of diabetes. Together with meal planning, home glucose monitoring, and medications, exercise helps people with diabetes lead longer lives with fewer complications (Schneider, 1990). Nurses working with persons with diabetes must understand how exercise influences the control of diabetes. The purpose of this study is to examine exercise adherence in persons with Type 2 diabetes and how the stages of change in exercise are related to metabolic control. Reported physical activity also will be related to stages of change in exercise. Processes of change in exercise and self-efficacy also will be explored in relation to stages of change in preparation for a future intervention study. The four hypotheses are as follows: (1) The control of diabetes in people with Type 2 diabetes will be directly related to their stage of exercise behavior. (2) Specific processes of change, for people with Type 2 diabetes, can be identified for each stage of exercise behavior. (3) Subjects' physical activity level will be directly related to their stage of exercise behavior. (4) Exercise self-efficacy in persons with Type 2 diabetes, will be directly related to their stage of exercise behavior.

Diabetes

According to the Centers for Disease Control and Prevention (1996), diabetes affects approximately 16 million people in the United States. Type 2 or noninsulin-dependent diabetes mellitus (NIDDM) comprises 90-95% of all cases of diabetes in the U.S. and Diabetes (both Type 1 and Type 2) is the seventh leading cause of death contributing to 169,000 deaths per year in the U.S. (CDC, 1996; National Institutes of health, 1997). Even though it's role in macrovascular disease is under dispute, diabetes does cause polyneuropathy, nephropathy, and retinopathy. The American Diabetes Association estimated the annual cost of diabetes at close to $138 billion in the U.S. in direct and indirect costs (American Diabetes Association, 1997; National Institutes of Health, 1997)

Tight control of blood glucose levels to near-normal has been shown to decrease microvascular complications of diabetes. The Diabetes Control and Complications Trial (DCCT) (1993, 1995)

demonstrated that intensive therapy (insulin pump or three or more daily insulin injections and frequent blood glucose monitoring), for people with insulin dependent (Type 1) diabetes, could lower average blood glucoses. This improved metabolic status slowed the progression of existing retinopathy, and significantly reduced the incidence of retinopathy, neuropathy, and nephropathy in all patients. However, there is much discussion regarding whether these results can be extrapolated to Type 2 diabetes, and whether insulin resistance and hyperinsulinemia may play even more important roles than glucose control. Researchers at Kumamoto University showed that intensive insulin therapy prevented progression of diabetic microvascular complications in people with Type 2 diabetes (Ohkubo, Kishikawa, Araki, Miyata, Isami, Motoyoshi, 1995). Results from the U.K. Prospective Diabetes Study (UKPDS) (1991) of 5,100 newly diagnosed people with Type 2 diabetes may reveal that near-normal control leads to decreased complications, morbidity, and mortality.

In recognition of the strong evidence found in the DCCT, the Kumamoto study, and the expected results of the UKPDS, the American Diabetes Association (ADA) issued practice standards for Type 1 and Type 2 diabetes mellitus. The ADA emphasized the importance of an initial history, physical exam, laboratory measures, and a management plan to achieve near normal blood glucose levels. The ADA's management plan includes medications, meal planning, home blood glucose monitoring, life-style changes and specialized services such as podiatry, opthamology, and dental. Almost every part of the plan has a detailed summary discussing methods and goals. However, "life-style changes" such as smoking cessation and exercise have no further direction on how to accomplish these major behavioral changes. These behavioral changes are very difficult for many patients to initiate and maintain.

Exercise and Diabetes

Exercise is an extremely important part of the management of diabetes and is recommended for all persons, including those with Type 2 diabetes and elderly patients (American Diabetes Association Council on Exercise, 1990; NIH Consensus Development Panel on Physical Activity and Cardiovascular Health, 1996; Schneider, 1990; Schwartz, 1990; Wallberg-Henriksson, 1992). Results of studies on insulin

sensitivity are mixed. Acute bouts of exercise (30-60 minutes/day, 4-7 days/week) have been shown to improve insulin sensitivity in those with Type 2 diabetes (Koivisto, Yki-Jarvinen, & DeFronzo, 1986; Vananeuchi, Shinezski, Chikada, Nishikawa, Ito, Shimizu, et al., 1995). However, Schneider, Amorosa, Khachadurian, and Ruderman (1984) failed to show improvement in insulin sensitivity following 6 weeks of thrice weekly training for eight 4-minute periods interrupted by 1.5 minutes of rest.

Although only minimal improvement in glucose tolerance has been found at 24-72 hours post exercise (Schneider et al., 1984; Koivisto et al., 1986), Schneider et al. (1984) did find significant improvement in plasma glucose levels at 12 hours post exercise and decreased glycosylated hemoglobin values after the 6 week training period. Similar improvements have been reported in two more recent studies (Barnard, Jung, & Inkele, 1994; Bourn, Mann, McSkimming, Walsdorn, & Wishart, 1994). Barnard et al. studied only short term effects of an aerobic program lasting 3 weeks that was combined with a very strict meal plan. However, the study's design makes it impossible to separate out the effects of meal planning from exercise. Bourn et al. found initially only 14% of their subjects with Type 2 diabetes exercised at the recommended goal of 30 minutes 3 days/week. This participation rate improved over the study period to 40-50%, however, exercisers and non-exercisers were not distinguished in the final outcome results reported. Although Bourn et al. demonstrated significant improvement in metabolic control over 2 years, the specific effect of exercise is not known.

Combined with dietary restrictions, aerobic exercise can also reduce macrovascular risk factors. Improvements in blood pressure and serum lipid panels have been shown in persons with Type 2 diabetes (Barnard, et al., 1994; Bourn, et al., 1994). Physical activity may even be a part of primary prevention of diabetes (Bonen, 1995; King & Kriska, 1992; Kriska, Blair, & Pereire, 1994; Manson & Spelsberg, 1994; Ruderman, Apelian, Schneider, 1990).

Adherence to exercise programs has not been well studied in persons with Type 2 diabetes. In the general public, researchers have found that between 39% and 60% of people studied do not participate in any physical activity program (Lee, 1993; Marcus, Pinto, Simkin, Audrain, & Taylor, 1994; Marcus, Rossi,

Selby, Niaura, & Abrams, 1992; Marcus & Simkin, 1993; Pinto & Marcus, 1995). Approximately 50% of those who join an exercise program will drop out over the first 3-6 months (Carmody, Senner, Manilow, & Mattarazzo, 1980; Dishman, 1988; Madsen, Sallis, Rupp, Senn, Patterson, Atkins, & Nader, 1993). Having diabetes does not improve or worsen the statistics on exercise in the general public described above. Ford and Harman (1995) found that a diagnosis of diabetes neither encouraged nor impeded one's decision to exercise. Regardless of the disease and its implications, people with diabetes, along with the general population, do not meet current national activity recommendations.

In spite of evidence that regular physical activity can improve diabetes control and that an exercise program is very difficult to initiate and maintain, there is little evidence that diabetes educators consider exercise an important outcome of a patient educational program. In a meta-analysis of patient education in diabetes, Brown (1992) did not measure exercise adherence or effects of exercise as intervention outcomes of diabetes education. Later, in a second meta-analysis on weight loss in Type 2 diabetes, Brown, Upchurch, Anding, Winter, & Ramirez (1996) found only 10% of 89 studies measured the metabolic effects of an aerobic exercise program. The effect of exercise alone on glycosylated hemoglobin levels were small (-0.5% to -1%), but when combined with diet and behavior therapy, glycosylated hemoglobin values decreased by 1.5%. This effect was, however, no larger than diet alone (Brown, et al., 1996). She also noted that the effects of exercise were only measured immediately and not longitudinally. "but the immediate and short-term effects on mean body weight were near zero" (Brown et al., 1996, p. 619). Padgett, Mumford, Hynes, and Carter (1988) found a similar lack of research on the effects of exercise on the management of diabetes. Only 5 of 94 studies measured exercise, and none were longer than 8 weeks. Rubin, Peyrot, and Sowdek (1991) found that diabetes education was effective in improving medication self-adjustment and glucose self-monitoring, however no significant effects were found for diet and exercise behaviors. The authors concluded that "effective education for patients who do not take insulin may require more expensive programs with frequent contact and long-term follow-up, because targets for improved metabolic control necessarily involves changes in life-style" (p. 338).

Theoretical framework

Nurses have a unique opportunity to improve adherence to exercise recommendations, but first, a greater understanding of behavioral change from a theoretical perspective must be explored (Dishman, Sallis, & Orenstein, 1985). In a review of literature, self-efficacy and the transtheoretical theory of change were determined to be effective in predicting exercise behavior. Both theories also showed promise for future intervention studies.

Hypotheses

1. The control of diabetes in people with Type 2 diabetes will be directly related to their stage of exercise behavior.
2. Specific processes of change, for people with Type 2 diabetes, can be identified for each stage of exercise behavior.
3. Subjects' physical activity level will be directly related to their stage of exercise behavior.
4. Exercise self-efficacy in persons with Type 2 diabetes, will be directly related to their stage of exercise behavior.

Definitions

Exercise is defined as any activity that uses "large muscle groups, over a prolonged period and is rhythmic and aerobic in nature (e.g. walking, hiking, running, machine based stair climbing, swimming, cycling, rowing, combined arm and leg ergometry, dancing, skating, cross-country skiing, rope skipping, or endurance game activities" (American College of Sports Medicine, 1995, pp. 156-157). Intensity should be moderate (Burress, 1996), duration should be from 20 to 60 minutes, and frequency should be 3 to 5 times per week (American College of Sports Medicine, 1995).

Intensive anti-diabetic therapy is considered three or more shots or insulin per day or more than sulfanylureas alone in oral therapy.

Assumptions

Patients will self-report honestly. Further reliability testing will not be done on these instruments.

Volunteers will not have complications that will limit their ability to exercise.

Patients will understand the role of exercise in the control of diabetes.

Patients will have knowledge on how to exercise.

Mathematical assumptions include homogeneity of variance, normality, and independence of observations.

Limitations/De-limitations

Limitations of this study will be the cross sectional design. Ideally, exercise adherence should be measured longitudinally for a period greater than six months when dropout rates typically increase. The sample will be a sample of volunteers, not randomly selected, which may self-select those with higher self-efficacy and exercise participation. These subjects will come from a population around Madison, WI. Due to the proximity of the university, these patients may have a higher educational background and propensity for exercise as compared with the rest of the state and country. This study is also being conducted during late summer and early fall, hence some climatic environmental barriers to exercise will not be encountered. Exercise will be measured by self-report which includes inherent problems of self-report. Objective measurement with the Caltrac accelerometer may prove useful for those who walk or run for exercise, however, the instrument can not be used to predict energy expenditure for those who swim.

The Review of Literature

Self-efficacy

Theory of Self-efficacy

Bandura (1977) first introduced the theory of self-efficacy to explain and predict psychological changes achieved by different treatment modalities. He presented self-efficacy as a cognitive process which can be altered by psychological procedures and mastery performance experiences. Bandura hypothesized that expectations of personal efficacy determine whether coping behavior will be initiated, how much energy will be expended, and how long it will be continued in the face of barriers. Successful experiences of mastery will enhance self-efficacy. Personal self-efficacy is formed from four sources: performance accomplishments, vicarious experience (watching others or modeling), verbal persuasion, and emotional arousal during the experience (fear, anxiety that could lead to avoidance behavior). Thirteen studies, from 1991-1995, evaluating the influence of self-efficacy on exercise behavior were reviewed.

Findings from self-efficacy studies

Fontaine and Shaw (1995), McAuley and Jacobson (1991), and McAuley, Wraith, and Duncan (1991) examined the influence of self-efficacy on exercise adherence during 8-10 weeks of exercise. All three studies found self-efficacy to be significantly correlated with exercise adherence and participation. Adherers scored significantly higher than low adherers and dropouts (Fontaine & Shaw, N=154; McAuley & Jacobson, N=58). Level of competence (beginner, intermediate, or advanced) was distinguished by level of self-efficacy. Those in higher levels of aerobic class possessed higher levels of self-efficacy than the next lower level (McAuley et al., 1991; N=265). Self-efficacy predicted exercise adherence during a longer period of 4-5 months, in a structured program (Duncan & McAuley, 1993; N=85) and a self-directed program (DuCharne & Brawley, 1995; N=63). Duncan and McAuley found social support to contribute to exercise indirectly through its effect on self-efficacy. DuCharne and Brawley measured two subsets of self-efficacy, scheduling-efficacy and barrier-efficacy, and found that after 9 weeks, only confidence in ability to

schedule exercise explained exercise adherence. All five research groups found self-efficacy to predict adherence in exercise programs lasting 8-20 weeks.

Two long term follow-up studies have been done. Sallis, Hovel, Hofstetter, and Barrington (1992) examined how 24 social learning variables predicted vigorous physical activity over two years in 1739 urban adults. Self-efficacy, social support and decreased barriers were significant predictors of change in exercise behaviors. McAuley and his associates published a series of articles relating to a study of 82 subjects as they progressed through a 5 month exercise program designed for sedentary adults and followed up after the program ended at 4, 5, and 9 months. During the exercise program, testing revealed that exercise-efficacy predicted frequency of exercise at 12 and 20 weeks. However, previous, pre-study, exercise history was a more powerful predictor of exercise frequency at 20 weeks (McAuley, 1992). Another interesting pattern that emerged, was that general-self-efficacy measured in the face of barriers did not contribute to predicting exercise frequency. Although attrition rates of almost 50% may have skewed results, McAuley found that self-efficacy was the only significant unique predictor of exercise at 4 months (McAuley, 1993) and 9 months (McAuley, Lox, & Duncan, 1993). Interestingly, they also showed that although specific exercise-efficacy had decreased over 9 months that it quickly returned to post program levels following an acute testing performance of that particular exercise. McAuley, Bane, & Mihlko (1995) replicated the initial study looking at difference in general-physical-efficacy, bicycle-efficacy, and walk/jog-efficacy following acute and chronic exercise experiences. In general, they found that exposure to extended programs evidenced more dramatic gains in efficacy than did acute bouts.

Only one recent intervention study was found that evaluated exercise and adherence-efficacy (McAuley, Courneya, Rudolph, & Lox, 1994). One hundred and fourteen subjects were randomly assigned to four groups (two intervention and two attention control) for a 20 week supervised program of aerobic exercise, flexibility, and strength training. The intervention groups received information on the four sources of self-efficacy (based on Bandura's [1977] theory: Mastery Accomplishments, Social Modeling, Social Persuasion, and Physiological System normal responses to exercise). The treatment groups

exercised more frequently, for a longer duration, and walked longer distance than the control group. The intervention had no direct effect on adherence-efficacy, but did influence frequency which in turn influenced efficacy. Initial adherence-efficacy predicted adherence at 2 months, efficacy at 2 months predicted frequency of exercise at 4 months, but only frequency at 4 months predicted adherence at 5 months. Frequency or past behavior was found to be a strong predictor of future exercise in two other studies (DuCarne & Bawley, 1995; McAuley, 1992).

Two research teams (Kavanagh, Gooley, & Wilson, 1993; Skelly, Marshall, Haughey, Davis, & Dunford, 1995) examined self-efficacy in 63 and 64 persons, respectively, with diabetes. The researchers compared the subjects' ability to maintain their regimen with respect to diet, exercise, glucose testing, and medications. Kavanagh et al. (1993) found that self-efficacy predicted diet, exercise, and blood sugar testing over 8 weeks. It was the most powerful single predictor in diet and the only significant predictor in exercise. Skelly et al. (1995) found similar predictive capacity of self-efficacy at the initial measurement, however four months later, it no longer predicted diet adherence and its influence on exercise had decreased from 53% to 29% of explained variance. Self-efficacy never had any influence on taking medications. It appears that self-efficacy may be a strong predictor of exercise adoption, but dwindles in its ability to influence exercise maintenance.

Summary of self-efficacy and exercise

Self-efficacy significantly predicted exercise across all studies reviewed (DuCharne & Brawley, 1995; Duncan & McAuley, 1993; Fontaine & Shaw,1995; (Kavanagh, Gooley, & Wilson, 1993; McAuley, 1993; McAuley & Jacobson, 1991; McAuley, Lox, & Duncan, 1993; McAuley, Wraith, & Duncan, 1991; Sallis, Hovel, Hofstetter, & Barrington , 1992; Skelly, Marshall, Haughey, Davis, & Dunford, 1995). Exercise behavior also influenced self-efficacy (McAuley, Bane, & Mihlko ,1995; McAuley, Lox, & Duncan, 1993). Self-efficacy may be a strong predictor of exercise adoption, but dwindles over time in its ability to influence exercise maintenance (McAuley, Lox, & Duncan, 1993; Skelly, Marshall, Haughey, Davis, & Dunford, 1995). Over time, past exercise behavior may be an even more powerful factor in

predicting exercise frequency (DuCharme & Brawley, 1995; McAuley, 1992). Social support also appears to influence exercise adherence (Duncan & McAuley, 1993; Sallis, Hovel, Hofstetter, & Barrington , 1992). The major weakness in trying to compare studies is the lack of a standard measurement tool. However, one of the strengths of self-efficacy is that it can be improved (Bandura, 1977; McAuley, Courneya, Rudolph, & Lox, 1994). "...effective modeling and behavioral rehearsal are two especially powerful techniques for enhancing self-efficacy" (Dishman, 1988, p. 209).

Theory of reasoned action and theory of planned behavior

Theories of reasoned action and planned behavior

The theory of reasoned action (Fishbein & Ajzen, 1975) emphasizes attitudes, subjective norms, intentions and behaviors. According to the theory, behavioral intentions best predict a person's behavior. These behavioral intentions remain stable over a short period of time and it is important that the measurement of behavior be close to the measurement of intentions to ensure prediction. Behavioral intentions are influenced by the individual's attitudes about the behavior and the individual's perception or subjective norm of what social pressures exist to perform or not perform the behavior. Attitudes and subjective norms are comprised of behavioral and normative beliefs. Attitude toward a behavior is a combination of two components: one that the behavior will lead to a specific outcome, and two, the evaluation of that outcome. Subjective norm is a combination of the person's perceptions of what others think one should or should not perform the behavior and the individual's motivation to comply with those expectations. This theory assumes that the behavior is under the person's volitional control.

Ajzen proposed an extension of the theory in his theory of planned behavior for use when studying behaviors not completely under the control of the individual. Ajzen added the concept of perceived behavioral control that has an indirect effect on intentions and a direct effect on behavior. Perceived behavioral control is the sum of control beliefs, either helpful or blocking, and perceived power of that control to make behavior performance easy or difficult. "...perceived behavioral control refers to people's perception of the ease or difficulty of performing the behavior of interest" (Ajzen, 1991, p. 183). In

describing his theory, Ajzen likens this construct of perceived control to Bandura's (1977) concept of self-efficacy discussed earlier. Theory of planned behavior proposes that positive attitude and/or subjective norm and perceptions of behavioral control will lead to intentions to perform behavior which is a strong predictor of actual behavior.

Findings from studies using the theory of reasoned action and theory of planned behavior

Nine studies of exercise, from 1990 to 1996, using the above theories were reviewed. Only one research group examined people with diabetes (deWeerdt, I., Visser, A. Ph., Kok, G., & van der Veen, E.A., 1990) using theory of reasoned action. The authors looked at four self-care behaviors specific to diabetes: home glucose monitoring, nutrition, insulin adjustment, and exercise. In their sample of 558 patients requiring insulin, aged 18-65 (M = 44, SD = 15.3), they found that attitude and social norm correlated weakly with exercise intention which had a strong correlation with behavior. However, exercise was measured by self report and the authors' definition of "regular exercise" was not clear.

Gatch and Kendzierski (1990) and Godin, Valois, and Jobin (1991) researched predicting intention to exercise and their results were contradictory. In 100 university females, both attitude and subjective norm contributed significantly to the prediction of intention to exercise and perceived behavioral control added significantly to this prediction (Gatch & Kendzierski, 1990). Godin et al. (1991) studied 161 cardiac patients following an uncomplicated myocardial infarction. Attitude and subjective norm were not found to be significant predictors of intention. However, other measures of exercise habit, perceived difficulty and perceived barriers were important predictors of intention in these cardiac patients.

Three later research teams looked at intention to exercise related to actual behavior and also reported mixed results. Two (Courneya & McAuley, 1995; Godin, Valois, & Lepage, 1993) found that intention predicted exercise behavior except in pregnant women (Godin et al., 1993). The authors of the second study (n= 564 males and non-pregnant females and n= 136 pregnant females) concluded that for the pregnant population, there may have been too much time and other changes that occurred between the measurement of intention (prenatal) and the measurement of exercise behavior (postpartum). Neither

study found a correlation of subjective norm or social influence with intention or behavior. In determining the role of perceived behavioral control, both studies found that it influenced intention, but failed to directly influence behavior. Godin et al. (1993) also found habit to be the best predictor of exercise behavior. The third study evaluated middle-aged smokers (Nguyen, Béland, Otis, & Potvin, 1996; N=669) and found no significant relationships between intentions and behaviors. Perceived behavioral control was correlated with behavior.

In studying the theory of planned behavior, two other research teams included self-efficacy in their variables (Biddle, Goudas, & Page, 1994; Terry & O'Leary, 1995). Biddle et al. (N=131) found that intention was best predicted by attitude for males and by attitude, perceived behavioral control, benefits, and self-efficacy for females. Physical activity was again best predicted by intention with attitude for men and self-efficacy for women. Terry & O'Leary (N=135) found no gender difference. They found that self-efficacy significantly predicted intentions and that perceived behavioral control did not. Again subjective norm failed to predict intentions. Interestingly, they found a direct effect on actual behavior, regardless of intention.

While considered a strength of the theory, the authors' recommended use of an elicitation study to develop measurement instruments for attitudes and subjective norm is problematic (Blue, 1995). These attributes are not uniformly measured across studies, making them difficult to compare and replicate. Internal reliabilities are often not reported. Gatch and Kendzierski (1990) reported reliabilities of 0.79 - 0.93, but Courneya and McAuley (1995) reported alphas of 0.59, 0.66, and 0.80 for attitude, subjective norm and perceived behavioral control respectively. These low values and lack of values lead the reader to question the results.

Summary of theory of reasoned action and theory of planned behavior in exercise

Fishbein's and Ajzen's theories predicted mixed results when applied to exercise behavior. Low internal reliability on attitude and subjective norm may have contributed to discouraging results. Perceived control, a concept closely related to self-efficacy (Ajzen, 1991), correlated with both intention and

behavior. Time between measurements of intention and behavior must be very close in order for predictive capacity to emerge. Thus the theory does not lend itself to the study of predicting long-term exercise adherence. Dzewaltowski, Nobel, and Shaw (1990) found that the constructs of social cognitive theory, including self-efficacy, were better predictors of exercise than those from theory of reasoned action and planned behavior.

Pender's Health Promotion Model

Theory of Pender's health promotion model

Pender developed her wellness focused model in 1982 (Pender, Walker, Sechrist, & Frank-Stromborg, 1990). She based her model on social cognitive theory and it has many structural similarities to the Health Belief Model. Where the Health Belief Model focused on illness prevention, the Health Promotion Model "focuses on health promotion without threat of disease identified as a behavioral determinant" (Pender et al., 1990). Seven cognitive/perceptual factors that influence the likelihood of engaging in health-promoting behaviors include: Importance of Health, Perceived Control of Health, Perceived Self-Efficacy, Definition of Health, Perceived Health Status, Perceived Benefits of Health-Promoting Behavior, and Perceived Barriers to Health-Promoting Behavior. Modifying Factors that can interact with the cognitive/perceptual factors in determining behavior are: Demographic Characteristics, Biologic Characteristics (body composition and weight), Interpersonal Influences (expectations of significant others and social norm), Situations Factors (health promoting options in the environment), and Behavioral Factors (prior exposure to health behavior). Cues to Action "are internal or external stimuli that trigger a health-related event" (Pender et al., 1990).

Findings from studies using Pender's health promotion model in exercise

Eight studies, from 1988 - 1996, using Pender's Health Promotion Model were reviewed. In these studies, none measured all aspects of the model. Most measure demographic characteristics and two or three cognitive/perceptual factors. One study (Pender, et al., 1990; N=589 adults), measured five of the possible seven cognitive/perceptual factors. This was the only research that tested the Importance of

Health. Pender et al. used a 10 item Health Value Survey (test-retest = 0.92) and did not find that this factor contributed to healthy life style.

Perceived Control of Health was evaluated in five studies (Duffy, 1988; Duffy, 1993; Gillis & Perry, 1991; Pender et al., 1990; Speake, Cowart, & Pellet, 1989). All except one (Gillis & Perry) used Form A of the Multidimentional Health Locus of Control Scale (MHLC), an 18 item scale which measures internal health locus of control, chance health locus of control, and powerful others health locus of control. Chronbach's αs ranged from 0.61 to 0.85 (Duffy, 1988; Duffy, 1993; Pender et al., 1990; Speake, Cowart, & Pellet, 1989). Three research teams (Duffy, 1988; Duffy, 1993; Speake et al.,1989) found that internal health locus of control had a significant positive relationship to exercise. Pender et al. found that internal locus of control emerged as an additional predictor of health promoting lifestyles after three months. Increased powerful others health locus of control was found to be significant in only one study (Speake et al.; N=297 adults), and decreased chance health locus of control was found to predict increased exercise by Duffy (1988; N=262 females). Gillis & Perry (N=92) used an 11 item instrument developed by the same author who developed the MHLC and reported "well documented" reliability and validity (Gillis & Perry, p. 303). However, they found no significant interactions.

Pender et al. (1990) was the only team that looked at perceived self-efficacy measured as perceived personal competence (not behavior specific) with the Personal Competence Rating Scale (α=0.78, Test-retest=0.80). They found belief in competence to be significantly related to improved healthy lifestyle. It should be noted that many studies evaluated self-esteem (Duffy, 1988; Duffy, 1993; Gillis & Perry, 1991) or self-acceptance (Volden et al., 1990) but these are not the same concept as self-efficacy and not included in Pender's model. Mixed results were found with two showing a positive correlation of self-esteem with exercise (Duffy, 1988; Duffy, 1993) and two not finding a correlation with exercise (Gillis & Perry, 1991; Volden et al., 1990).

The definition or meaning of health was reviewed by two studies (Pender et al. 1990; Volden, Langemo, Adamson, & Oeshsle, 1990) using the Laffrey Health Conception Scale (Cronbach's α - 0.88 -

0.95 and test-retest - 0.78) Volden et al. (N=478 adults) found that women and all regular exercisers demonstrated a higher meaning of health. Pender et al. also found a correlation between the definition of health and reported healthy lifestyles.

The perception of health status was evaluated by seven studies (Duffy, 1988; Duffy, 1993; Gillis & Perry, 1991; Neuberger, Kasal, Smith, Hassanein, & deViney, 1994; Pender et al., 1990; Speake et al., 1989; and Volden et al., 1990). Four research teams used the Health Perceptions Questionnaire (HPQ) or selected subscales of the tool. Chronbach's αs ranged from 0.45 to 0.92; all but one (Gillis & Perry, 1991) reported αs>0.67. Gillis and Perry found no significant contribution of the HPQ in their population studied (N=92 females). Pender et al., Duffy (1988), and Duffy (1993; N=383 adults) found that perceptions of current health status related positively to increased exercise and healthy lifestyles. Neuberger et al. (1994; N=100) used an item from the Arthritis Impact Measurement Scale (AIMS) to demonstrate that her subjects did not perceive themselves to be in poor health and this was not a significant predictor of exercise participation. Speake, et al. used a Likert type scale to evaluate past health status, present health status and health status compared to others. They found that subject who were white and with higher education tended to perceive themselves as having better health compared to others. They also found that positive perceptions of past health contributed to increased exercise. Volden et al. (1990) using the Philadelphia Geriatric center Multilevel Assessment Inventory (MAI) found that no age or gender differences existed, but that maintenance exercisers exhibited higher perception of health status. In general, perception of health status seems to correlate positively with exercise behavior.

Benefits and barriers to exercise were evaluated in two studies (Jones & Nies, 1996; Neuberger et al., 1994). They both used the same scale: Exercise Benefits/Barriers Scale and obtained very reliable Chronbach's αs of 0.83 - 0.93. Neuberger et al. studied 100 predominantly white arthritis patients and found significant correlations of benefits to exercise. Jones and Nies (1996), who studied 30 African American women, found that both benefits and barriers contributed significantly to reported exercise behavior.

Only one study (Neuberger et al., 1994) attempted to include any modifying factors other than demographics. They found that of 8 modifying factors studied (age, income level, educational level, arthritis specific factors, Body Mass Index, and previous participation in exercise), only past exercise history contributed significantly to perceived benefits of exercise. None of the modifying factors contributed to the aerobic fitness of the subjects.

Measurement of exercise behavior was usually obtained through self-report using the Health Promoting Lifestyle Profile (HPLP) (αs=0.66 to 0.94; exercise subscale, when reported separately, was above 0.73). Gillis and Perry (1991) measured participation in a 12 week exercise program. Neuberger et al. (1994) in addition to the HPLP, used measures of activity with the Stanford 7 day activity recall, and aerobic fitness with a bicycle ergometer test to determine oxygen uptake. Standardization of exercise measurement could improve comparisons across studies.

Summary of Pender's health promotion model in exercise

Not all aspects of Pender's model relate to exercise behavior, however, internal locus of control, definition or meaning of health, perceived self-efficacy, perceived health status appeared to correlate with exercise. Benefits and barriers may also play a significant role in determining exercise. Further research is required to determine the roles of other factors in determining exercise adherence.

Transtheoretical theory of change

Theory of transtheoretical change

Prochaska and DiClemente (1982; 1983) outlined transtheoretical therapy in an effort to present an integrative model of change. In a review of 18 leading therapy systems, ten basic processes of change were identified. The verbal therapies, or experiential processes, include consciousness raising (feedback and education), dramatic relief (affective aspects, often intense emotional experiences), self-reevaluation, environmental reevaluation, and social liberation (awareness, availability, and acceptance of alternative, problem-free life styles). The behavioral therapies are counter-conditioning (substitution of alternative behaviors for the problem behavior), helping relationships, reinforcement management (changing

contingencies that control or maintain the problem behavior), stimulus control, self- liberation (choice and commitment to change the problem behavior, including the belief that one can change). Five stages of change were identified: Precontemplation (not yet thinking about change), contemplation (thinking about acting), determination (ready to act), action, and maintenance. The verbal processes apply to the contemplation and determination stages, with dramatic relief bridging contemplation and determination. The behavioral processes then apply to the action and maintenance stages. The authors show that the verbal and behavioral processes are not theoretically incompatible, but the verbal processes are more important to the individual preparing for change, and behavioral processes become more important once they have begun to take action. Two assumptions are important. One assumption is that the patient has positive expectations in order to begin therapy, but this is not critical once therapy is in progress. The importance of a warm, trusting relationship is the second assumption that is needed for therapy to progress. The therapist, spouse, and client should all be aware of the client's stage of change in order to ensure they are working on the right stage and to support the appropriate processes. If there is not congruence then the client will become dissatisfied and terminate therapy.

Initially, the theory was tested on smoking cessation. Five studies (DiClemete, Prochaska, Fairhurst, Velicer, Velasquez, & Rossi, 1991; Prochaska, Crimi, Lapsanski, Martel, & Reid, 1982; Prochaska & DiClemente, 1983; Prochaska, DiClemente, Velicer, Ginpil, & Norcross, 1985; Wilcox, Prochaska, Velicer, & DiClemente, 1985) revealed that large samples (N>866) were readily categorized into stages of change and the processes of change used in each stage were distinguished. This theory suggests that each stage of change has different characteristics that should be emphasized in an intervention. The cyclical nature of these stages can explain the individual's regression or relapse in behavior.

Findings from studies using transtheoretical model

Ten articles since 1992 were reviewed that have applied the transtheoretical theory of change to exercise in the general population. Marcus has been a pioneer in applying Prochaska's and DiClemente's

(1982) theory of transtheoretical change to exercise. She first developed, refined, and tested a scale to measure stages of change in exercise (Marcus, Selby, Niaura, & Rossi, 1992; Marcus & Owen, 1992, Marcus, Pinto, Simkin, Auchain, & Taylor, 1994; Marcus, Rakowski, & Rossi, 1992). Test-retest over two weeks was 0.90 and the kappa index of reliability over the same period was 0.78. The stages of exercise were related to exercise self-efficacy (Marcus & Owen, 1992; Marcus, Pinto et al., 1994; Marcus, Selby et al., 1992; αs=0.76 to 0.85). Three research teams (Marcus & Owen, 1992; Marcus, Pinto et al., 1994; Marcus, Rakowski, et al., 1992) also compared stages with a decisional balance scale of pros and cons. Marcus, Rakowski, et al. (1992) had good reliabilities on both tools (pro α=0.95 and cons α=0.79). Unfortunately, Marcus and Owen (1992) only had acceptable reliability in their "pro" measurement tool (α=0.70), and Marcus, Pinto et al. (1994) had αs less than 0.70 on both scales. In the studies done in the U.S. (Marcus & Owen; Marcus, Selby, et al., 1992), self-efficacy defined the top three stages, but failed to distinguish precontemplators from contemplators. However the decisional balance scale improved the ability of the researchers to define all stages (Marcus, Rakowski, et al., 1992). In Australia (Marcus & Owen, 1992), precontemplation and contemplation were differentiated by self-efficacy. Self-efficacy in maintenance was higher than in preparation; and self-efficacy in action was higher than in contemplation. However, self-efficacy failed to distinguish between all other neighboring stages. Decisional balance was also not as accurate and was only able to show precontemplators as being significantly different from all the other stages. Neither study found any differences between gender and stage of exercise. They did find that younger subjects exercised more.

When stages of exercise are matched against the Stanford 7 day Physical Activity Recall, two studies found good correlation (Cardinal, 1995; Marcus & Simkin, 1993). Marcus & Simkin (1993) collapsed the five stages into three stages (precontemplators/contemplators - no exercise; preparers - irregular exercise; action/maintainers - 20 minutes of exercise 3 times per week). They found large effect size distinguishing the three groups in vigorous activity and medium effect size in distinguishing moderate exercise. Cardinal was also able to develop another stages of exercise scale (Spearman's rho of 1.00;

$p<0.0001$). This scale is a shortened version of that developed by Marcus, Rakowski, et al. (1992) and offers an alternative reliable measure of the stages of exercise.

Certain characteristics of different stages can be identified, such as type of exercise chosen, knowledge of exercise, benefits, and barriers. Activities most frequently endorsed by 100 young university subjects were: running, lifting, cycling, swimming/water polo, and aerobics (Pinto & Marcus, 1995). Those in the action stage are most likely to use running, lifting and cycling. In a middle aged population of 431 females, women who walked as their exercise were more likely to be preparers or action/maintainers and those who selected running, swimming, biking, or dancing were more likely to be action/maintainers (Marcus, Pinto, et al., 1994). The researchers also found that significantly fewer women in the action/maintenance stage had children under 18 at home. Lee (1993) found in 286 women, aged 50-64, that precontemplators scored significantly lower on exercise knowledge and psychological benefits than contemplators. Lee's study was also designed to examine attitudes, pros, cons, perceived subjective norm, and perceived family support, however, her alphas were all under 0.70 (except psychological benefits) and will not be reported. Two research teams examined both men and women, and found no gender differences (Lee, 1993; Pinto & Marcus, 1995).

Marcus, Rossi, Selby, Niaura, and Abrams (1992) was the only team that evaluated the process of change. They developed and tested a new scale of the 10 processes (all αs 0.70 to 0.89 except social liberation at 0.62). In differentiating the stages of change using the processes of change, they found that three of the five experiential processes (dramatic relief, environmental re-evaluation, and self-reevaluation) were used more frequently in the action stage than in maintenance. The preparation and contemplation stages were differentiated by three scales (counterconditioning, reinforcement management, and self-liberation). The differences between preparation and action were significant on all behavioral processes; but the frequency of use did not differ between actors and maintainers. The use of these processes differed between smokers and exercisers. Smokers trying to quit used behavioral processes less in maintenance than in action, the exercisers could not be distinguished between the two stages. Smokers' use of

experiential processes peaked in preparation and then declined through action and maintenance. Exercisers used their experiential processes most in the action stage.

Marcus, Banspach, Lefebvre, Rossi, Caleton, & Abams (1992) was the only team to do an intervention study using the processes of change. They looked at stage of exercise before their intervention and then again after the intervention. Unfortunately, as the authors admit, there was no random assignment and no control group, however their evaluation of 236 subjects with a mean age of 43.3 years showed significant results. Following the initial survey, the subjects were mailed stage specific information designed to increase or maintain their level of activity. A follow-up telephone survey, at six weeks, was then accomplished to determine stage of exercise adoption following the intervention. Of those originally in contemplation, 31.4% moved on to preparation and 30.2% moved into action. Of those in preparation, 61.3% moved into action and only 4% regressed to contemplation. In the action stage, only 10% regressed to preparation. Again they found post intervention stage to be unrelated to gender, Body Mass Index, education, occupation, or income.

Summary of the transtheoretical model in exercise

Prochaska and Marcus (1994) conceptualize the initiation of physical activity as the "cessation of a sedentary life style" (p.176). Self-efficacy played a major role in determining stages of change (Marcus & Owen, 1992; Marcus, Pinto, Simkin, Auchain, & Taylor, 1994; Marcus, Selby, Niaura, & Rossi, 1992). Benefits and barriers (pros and cons) may also be important factors (Lee, 1993; Marcus & Owen, 1992; Marcus, Pinto, Simkin, Auchain, & Taylor, 1994; Marcus, Rakowski, & Rossi, 1992). Action/maintainers were more likely to select running, swimming, biking, dancing, or lifting for their physical activity (Marcus & Pinto, 1994; Pinto & Marcus, 1995). Each stage used varying levels of the 10 processes of change (Marcus, Rossi, Selby, Niaura, & Abrams, 1992). Supporting these processes of change with stage-matched interventions were shown to be effective in moving individuals into a higher stage of exercise adoption (Marcus, Banspach, Lefebvre, Rossi, Caleton, & Abrams, 1992).

Conclusion

Exercise is a major part of the diabetes treatment plan. Physical activity has been shown to reduce blood glucose and improve metabolic control. Researchers have shown that fewer than 60% of the population, including those with diabetes, exercise on a regular basis (Lee, 1993; Marcus, Pinto, Simkin, Audrain, & Taylor, 1994; Marcus, Rossi, Selby, Niaura, & Abrams, 1992; Marcus & Simkin, 1993; Pinto & Marcus, 1995). Of those who enroll in formal exercise programs, about half drop out after 6 months (Carmody, Senner, Manilow, & Mattarazzo, 1980; Dishman, 1988; Madsen, Sallis, Rupp, Senn, Patterson, Atkins, & Nader, 1993). Health care providers must improve their understanding of how persons initiate and maintain a regular exercise program. Nurses, who have regular contact with their patients, are ideal coaches to encourage exercise participation.

Of the four major theories discussed, self-efficacy was shown to significantly effect initial exercise adherence. Frequency of behavior was also a more powerful predictor of exercise maintenance. Additional research is needed to determine the role of social support and barriers. Research using Ajzen's theory of planned behavior to predict exercise intentions and behavior proved to be contradictory and is unable to predict long-term adherence. Pender's Health Belief Model showed strength in five variables: internal locus of control, definition or meaning of health, perceived health status, perceived self-efficacy, and perceived benefits. However the other aspects of the model did not correlate with exercise and the measurement instruments require refinement.

There is a lack of research on diabetes and exercise maintenance. In persons with diabetes, self-efficacy was found to be a significant predictor of exercise adherence, although, its influence decreased over time. Dishman (1988) states that research on exercise should include not only predictive constructs, but also the process of change. The transtheoretical model offers an opportunity to study the processes of change. Transtheoretical stages of exercise adoption can determine characteristics of individual stages and stage specific interventions have been successfully employed. Further research on theory based behavior change in exercise is needed for patients with diabetes. Self-efficacy and the Transtheoretical Model may

prove useful. Therefore this study will examine the stage of change in exercise, the reported level of physical activity, self-efficacy, and the processes of change in a sample of persons with Type 2 diabetes. The relationship between metabolic control and levels of physical activity will also be examined.

One of the limitations of conducting research on exercise is that of self-selection (Dishman, 1988). The majority of the researchers studied groups of white, middle class volunteers. These volunteers are likely to be the most self-efficacious and more committed to exercise. The larger studies conducted by Marcus and her teams may have captured some reluctant volunteers, but attention should focus on those who are not volunteering for exercise programs. The smaller studies also did not use a power analysis to determine adequacy of sample size. Most of the previous research has examined exercise adherence from 8-20 weeks. Intervention studies designed to measure long-term maintenance of exercise in persons with diabetes should be done.

Dishman (1994) reviewed research on exercise over the preceding 5 years. He noted that valid measures need to be developed for physical activity and potential determinants that are comparable across studies. Exercise should be described in terms of type, frequency, duration and intensity. Care should be taken in developing a research design to use reliable, standardized measurement tools.

In clinical practice, it is important to understand that behavioral change has many variables that can be enhanced. Self-efficacy can be enhanced simply through behavioral practice, watching others, verbal persuasion, and reducing fear and anxiety to decrease avoidance behavior. Benefits and barriers can be reviewed with the patient and information of resources to overcome barriers shared with patients. Finally, by establishing the patient's stage of readiness for exercise, the provider and patient can ensure that they are working on the right stage. Appropriate information can be matched to the correct stage to ensure progression and avoid regression.

Method

Design

This study will be a descriptive correlational study using a cross-sectional design.

Hypotheses

1. The control of diabetes in people with Type 2 diabetes will be directly related to their stage of exercise behavior.
2. Specific processes of change, for people with Type 2 diabetes, can be identified for each stage of exercise behavior.
3. Subjects' physical activity level will be directly related to their stage of exercise behavior.
4. Exercise self-efficacy in persons with Type 2 diabetes, will be directly related to their stage of exercise behavior.

Instruments

Stages of Change

To ascertain stages of exercise, the Exercise Stages of Change Questionnaire (Marcus, Rossi, Selby, Niaura, & Abrams, 1992) will be employed. Kappa index of reliability over two weeks = 0.78. Five items identify the five stages of change: precontemplation, contemplation, preparation, action, and maintenance. Precontemplation stage includes those who have no intention of exercising in the next 6 months and contemplation stage includes those who intend to exercise in the near future. Preparation stage includes those who currently exercise, but have done so for less than 3 months. Action stage includes those who have exercised for 3-6 months and maintenance stage includes those who have exercised for more than 6 months.

Processes of Change

The processes of change will be measured by the Exercise Process of Change Questionnaire (Marcus, Rossi, et al., 1992). Alpha coefficients range from 0.62 [Social liberation] to 0.88 (all others ≥

0.71). Exercise Process of Change Questionnaire is a 40 item test that identify which of the ten processes are used most. Those ten processes are defined by Marcus, Rossi, et al. (1992) as follows (The problem behavior is sedentary life-style):

Experiential Processes

1. Consciousness Raising - efforts by the individual to seek new information and to gain understanding and feedback about the problem behavior

2. Dramatic Relief - affective aspects of change, often involving intense emotional experiences related to the problem behavior

3. Environmental Reevaluation - consideration and assessment by the individual of how the problem affects the physical and social environment

4. Self-Reevaluation - emotional and cognitive reappraisal of values by the individual with respect to the problem

5. Social Liberation - awareness, availability and acceptance by the individual of alternative, problem-free life styles in society

Behavioral Processes

1. Counterconditioning - substitution of alternative behaviors for the problem behavior.

2. Helping Relationships - trusting, accepting, and utilizing the support of caring others during attempts to change the problem behavior

3. Reinforcement Management - changing the contingencies that control or maintain the problem behavior

4. Self-Liberation - the individual's choice and commitment to change the problem behavior, including the belief that one can change

5. Stimulus Control - control of situations and other causes which trigger the problem behavior

Metabolic control

Diabetes control will be assessed with data retrieved from the patient on height and weight to calculate body mass index, serum HgA1C, and lipid panels. Medication regimen will also be identified from the patient. As meal planning is an important aspect of diabetes control, subjects will also be asked to circle their current meal plan and determine the percentage of time in quartiles (from 0%, 1-25%, 26-50%, 51-75%, and 76-100%) that they follow their prescribed plan.

Physical Activity

Activity levels will additionally be assessed through a telephone interview using the Stanford Seven Day Activity Recall questionnaire (Baranowski, T., 1988; Blair, Haskell, Ho, Paffenbarger, Vranizan, Farquar, & Wood, 1985; Dishman & Steinhardt, 1988; Taylor, Berra, Laffaldano, Casey, & Haskell, 1984). Williams,Klesges, Hanson and Eck (1989) found a "strong convergence between the Stanford and the daily log. The daily log correlated with the Stanford 0.68, 0.84, and 0.82 for the first, second and third weeks respectively (all p values < 0.001)" (p. 1165). They also found that test-retest reliability ranged from 0.75 to 0.84. Dishman and Steinhardt (1988) reported similar correlations (r's = 0.82 to 0.87).

Self-efficacy

Exercise self-efficacy will be measured by a five item self-efficacy scale used by Marcus, Selby, et al. (1992). Internal consistency was reported at 0.82 and a test-retest of 0.90. The five item confidence scale measures the subject's confidence in their ability to participate in exercise in the face of certain barriers (feeling tired or in a bad mood, having no time or on vacation, and environmental factors).

Procedure

Patients will be informed of the study through signs posted in the clinics they visit. The nurses and physicians in these clinics may also inform the patient about the study. Interested patients will call the investigators via the number posted on the sign. The investigators will send a package to patients with Type 2 diabetes who respond. The package will include a cover letter explaining the intent of the research,

a consent form, and questionnaires to measure demographics, stages of change, processes of change, and self-efficacy. The questionnaires will not have identifying codes linking them to individual participants, so confidentiality can be maintained. Those that return the consent form and questionnaires will be contacted by phone to complete the Stanford seven day physical activity recall. The interviewer will have no knowledge of the results of the questionnaires prior to the telephone interview. Again, confidentiality will be maintained.

Analysis of data

ANOVA will be used to analyze the data in all four hypotheses. A t-test will be used to compare results of this study with those found in the literature on non-diseased participants (Marcus & Owen, 1992; Marcus, Pinto, Simkin, Auchain, & Taylor, 1994; Marcus, Rossi, Selby, Niaura, & Abrams, 1992; Marcus, Selby, Niaura, & Rossi, 1992). See appendices for directions on coding Exercise Stages of Change, Exercise Processes of Change, Self-Efficacy, and 7-d Stanford Physical Activity Recall Questionnaires.

Results

Sampling and surveying process

Forty-eight surveys were mailed out to persons who had verbally agreed to participate in the study. Ten days prior to the end of data collection, reminder postcards were sent to those who had not yet responded. A total of 30 surveys were completed and returned. Two of these participants were excluded secondary to medical problems that precluded exercise, leaving a sample size of 28. One had a knee injury which prevented the patient from exercising (per patient report) and the other reported stopping exercise secondary to cardiomyopathy and dysrhythmias. This study was designed to evaluate exercise habits of persons with diabetes Type 2 who did not have medical problems that limited their ability to exercise, hence the research team elected to exclude these two subjects. One person did not fill out the processes of change and self-efficacy portions of the survey. Occasionally, there were isolated missing values which will be reported in the tables as they pertain to the analysis.

Twenty three persons completed the Stanford 7 day activity recall. One interviewer contacted each participant and followed the suggested script obtained from the Cooper Institute for Aerobics Research in Dallas, TX (see Appendix F). Of those who were unable to be contacted, one had moved out of state and did not leave a forwarding number, one never answered, one was a wrong number, and the other two never connected at a convenient time.

Sample characteristics

Subjects were assigned a stage of exercise adoption (Precomtemplation -1, Contemplation - 2, Preparation - 3, Action - 4, and Maintenance - 5) based on answers to the first five questions in the survey (see Appendix A). Two stages (1 and 4) only had one subject (see Table 1). For analysis of variance, stages 1 and 2 (pre-contemplation and contemplation) were combined into one group and stages 4 and 5 (action and maintenance) were combined into one group leaving a collapsed model with three stages. In addition for T-test analysis, stage 1, 2, & 3 were collapsed into a group entitled "non-exercisers" and

stages 4 & 5 were combined to form "exercisers". For other calculations, the individuals in stages 1 and 4 were omitted. These will be addressed as they are reported.

The mean age of the subjects was 58.61 ranging from 35 to 77. The mean age at diagnosis was 50.64 with a range from 31 to 75. There was a significant difference in age among the stages (see Table 2) and between exercisers and non-exercisers (see Table 3 and Figure 1). Those in action and maintenance stages (3rd stage of the collapsed model) were significantly older (M=63.31) than those in the preparation stage (the 2nd stage of the collapsed model; M=46.60) and the age at diagnosis was significantly older in the higher stages (M=56.69) compared with the lower stages (M=40.2 and 44.29 for prepartion amd precontemplation/contemplation groups respectively). The number of years since diagnosis was not statistically significant between the stages.

Differences in gender, employment status, use of intensive anti-diabetic medications or cholesterol lowering agents were not significant across the stages or between exercisers and non-exercisers. Fourteen of the participants (50%) did not feel that they followed a specific meal plan. Twenty eight percent followed a pyramid meal plan, 3 subjects (10.7%) followed a healthy heart meal plan and one subject counted carbohydrates. In examining the percentage of time that the meal plan was reportedly followed, there was a trend among exercisers to follow their meal plan more closely, however it was not statistically significant (see Table 4).

The most frequent type of exercise reported was walking. Thirty-five percent chose walking alone and an additional 60% who chose walking or treadmill as part of their fitness program (see Table 5). Other activities included bicycling, swimming, Stairmaster, weightlifting, and cross-country ski machine. Reasons for not presently exercising and for quitting in the past varied (see Tables 6 and 7). Pain, lack of time, and lack of place to workout were the most often cited reasons for stopping exercise and not currently exercising. Three persons reported no complications from diabetes. Eleven (55%) reported that they had high blood pressure, 8 (40%) reported symptoms of peripheral neuropathy, and 4 (20%) reported having

retinopathy (see Table 8). No significance across the stages or between exercisers and non-exercisers was found for complications.

Hypothesis # 1: The control of diabetes in people with Type 2 diabetes will be directly related to their stage of exercise behavior.

Analysis of variance was used to evaluate control of diabetes with stages of exercise. The stages of exercise were collapsed into 3 stages as described earlier (precontemplation and contemplation were combined to build stage 1, preparation created stage 2, and action was combined with maintenance to construct stage 3). Control of diabetes was measured by HgA1C, Body Mass Index (BMI) and Cholesterol to HDL ratio. HgA1C values ranged from 5.6 to 17.7 with a mean of 7.9. HgA1C significantly differentiated between stages 1 and 3 of the collapsed model (see Table 9; $p=0.048$). However, when intensive medical therapy (≥3 shots per day or use of any oral therapy other than sulfonylurea alone) was controlled for, HgA1C no longer significantly differentiated stages ($p=0.56$) (see Table 10). In comparing the use of conventional and intensive medical therapies, nine exercisers used conventional therapy and seven were prescribed intensive regimens. Two non-exercisers used conventional and ten used intensive therapies (see Table 11). Across the stages of exercise, the same pattern emerges. Those in stage 5 used both conventional and intensive therapies almost equally (7 and 8 respectively); but in the lower stages, intensive medical therapy was used more often. The individual in stage 4, all persons in stage 3, half of those in stage 2 and the individual in stage 1 all used intensive therapy (see Table 12). HgA1C also correlated positively with BMI ($r=0.443$, $p\leq0.05$; see Table 13) and had a negative correlation with number of days a subject exercised (moderate activity at 20minutes) per week ($r=0.505$, $p\leq0.05$) (see Table 16).

BMI ranged from 18.99 to 48.78 and significantly differentiated between stage 3 and the other two stages (see Table 14). Those in stage 3 had a lower BMI ($M=28.66$) than those in stage 1 ($M=37.55$; $p=0.003$), and those in stage 2 ($M=40.85$) were higher than those in stage 3, ($p=0.000$). BMI also was significantly lower in exercisers than non-exercisers ($M=28.66$ and 38.93 respectively; see Table 15) and

correlated negatively with number of days per week of exercise (r=-0.535, p<0.01; see Table 16). BMI also correlated positively with cholesterol-HDL ratio (r=0.512, p≤0.05; see Table 13) (r=-0.535, p<0.01).

The cholesterol-HDL ratios ranged from 3.29 to 8.86 with a mean of 5.69. In controlling for the effect of lipid lowering agents, the cholesterol to HDL ratio did not differentiate the stages (see Table 17). Although cholesterol levels failed to differentiate stages, the trend was in the direction expected. Total cholesterol decreased from stage 1 to stage 3, HDL increased from stage 1 (M=32.67) to stage 3 (M=42.00), and cholesterol to HDL ratio decreased from stage 1 (M=6.67) to stage 3 (M=5.08; see Table 18). Using Kendall's Tau, the ratio correlates negatively with the stage (r=-0.470, p<0.01) (see Table 16). When exercisers are compared with non-exercisers, those who exercise did have significantly lower cholesterol-HDL ratios than those who do not (p=0.02) (see Table 15).

Hypothesis # 2: Specific processes of change for people with Type 2 diabetes. Can be identified for each stage of exercise behavior

In examining the processes of change for statistical analysis, the individual subjects in stages 1 and 4 were not considered. Only stages 2 (contemplation), 3 (preparation), and 4 (maintenance) were examined. Of the 10 processes (Consciousness Raising - CR, Self Liberation - SL, dramatic Relief - DR, Environmental Reevaluation - ER, Helping Relationships - HR, Stimulus Control - SC, Counter Conditioning - CC, Social Liberation - SOL, Self Reevaluation - SR, and Reinforcement Management - RM), only counter conditioning differentiated between stages 5 and 2 (see Table 19).

Hypothesis # 3: Subjects' physical activity level will be directly related to their stage of exercise behavior

The telephone survey was used as an internal check to assess the validity of the self-report on the mailed survey. During the telephone interview, the researcher was able to clarify and categorize activity into moderate, hard, or very hard activity levels. Activities such as raking leaves, scrubbing floors, and mowing the lawn with a push mower were included as well as any fitness activity. The 7-day activity recall (telephone survey) yielded kilo-calories per kilogram per day (kalperkg) and number of days per

week of moderate activity lasting a minimum of 20 minutes (exerdays). The telephone survey (kalperkg) did not significantly differentiate between the stages of the collapsed model, however, there was an upward trend as expected (stage 1 M=33.3 and stage 3 M=37.9; see Table 20). Days of exercise as determined by the telephone survey (exerdays) did not significantly correlate with those reported by the participants on the mailed survey regarding an exercise program (dysexerc). However, those in precontemplation and contemplation did not answer this question on the survey. Both measurements did correlate with stage ($p<0.01$) and differentiated exercisers from non-exercisers (see Table 16). Exercise days, as established by the telephone survey, significantly differentiated between stages 1 and 3 (M=5.16 and 2.6 respectively, $p=0.005$; see Table 20).

Hypothesis #4: Exercise self-efficacy in persons with Type 2 diabetes, will be directly related to their stage of exercise behavior

Self-efficacy was not found to be a significant differentiator between stages. Contemplators were highest, followed by maintainers, then preparers. There is, however, a trend among exercisers and non-exercisers. Those who exercise report a slightly higher mean than those who are not exercising (M=96.14 and 90.36 respectively; see Table 21).

Discussion

Limitations

All but four subjects were recruited directly from the Diabetes Clinic. This clinic provides exceptional support to the patient with nutrition and nursing visits (often weekly telephone visits) in addition to endocrine specialty visits and intensive therapeutic medical regimens. The sample included no minorities and most were from within an hour's drive of Madison, Wisconsin. As predicted, this sample was more active than expected in the general population leading to a skewed distribution among the groups. This study set out to measure a minimum of 84 subjects to obtain a power of 0.80. Only 28 subjects were obtained and two of the five groups only had an n of 1, thus preventing certain analyses.

The timing of the surveys occurred during October and November. People's exercise habits may differ during the colder months from those of summer. Also, the mailed surveys were completed first and then the telephone recall was completed up to 30 days later. Ideally, these should have been completed simultaneously to ensure elimination of a seasonal effect causing differences between the two surveys.

This study is a cross sectional design which limits the ability to predict how patients move from one stage to another and which processes change as individuals move forward or regress. This research was also dependent on self-report. The patients were expected to be honest and objective. The sample was a convenience sample of volunteers that were self-selected. It was expected that these volunteers would score higher on self-efficacy and would tend to be exercisers more than non-exercisers.

Interpretation of Results

Distribution among stages of exercise adoption was unusual. Only one individual was in stage 1 (3.6%), six individuals were in stage 2 (21.4%), 5 subjects were in stage 3 (17.9%), again only one individual in stage 4, and 15 participants were in stage 5 (53.6%). Marcus, Rossi, et al. (1992) found 24% in precontemplation, 33.4% in contemplation, 9.5% in preparation, 10.6% in action and 22% in maintenance. In this study, more than half of the participants were in the maintenance stage. Exercise may be a larger part of education in the Diabetes Clinic than in other practice settings. This clinic appears

to support the recommendations of Rubin, Reyrot, and Sowdek (1991). They found that education improved compliance with home glucose testing and self-adjustment of medications, but did nothing to improve adherence to meal plan or exercise. They further hypothesized that frequent contact and long term follow-up would be needed for increased metabolic control. The Diabetes Clinic accomplishes these two goals.

HgA1C appears to decrease with stage of exercise, however it is important to recognize the effect intensive therapy has on improving this value. The size of the sample and the environment in which they are managed may have skewed this result. In comparison with conventional therapy, the frequency of use of intensive therapy is used to a greater extent among the non-exercisers (stage1-3). Conventional therapy is used by 77% of the exercisers, yet only 20% of the non-exercisers used conventional therapy (see Table 11). HgA1C is strongly correlated with BMI which would be expected as fat interferes with insulin sensitivity.

BMI was the only measurement of control that significantly differentiated between the stages. Those in the lower stages had a greater BMI than those in stage 3 of the collapsed model. Interestingly, the Telekcal calorie count (calculated as Kcal/Kg/day), obtained from the telephone survey, correlated negatively and significantly to stage (r=-0.468, p=0.006; see Table 16). This is in direct opposition of what was expected and it is related to the larger weights in the lower stages. In this study, as the stage of exercise adoption increased, age increased and BMI decreased. Non-exercisers had a significantly larger BMI and were significantly younger than exercisers (see Figure 2). Marcus and Owen (1992) found that those in the higher stages of exercise were younger. Among this middle aged to elderly group of individuals, this was not the case. Perhaps the younger population in the group had other factors which kept them from exercising such as children at home, longer work hours, or other responsibilities to family and community which were not measured. Retired status was not significantly different among the groups, but possibly a larger sample with greater power would have shown a significant trend in retired status and exercise habits. Although Cholesterol to HDL ratio was not significant between stages, the mean of the

cholesterol to HDL ratio decreased among the stages of the collapsed model. Only those in stage 5 were below a ratio of 4.5 (see Figure 3). Shown with HgA1C, the mean of cholesterol to HDL ratio decreased across the stages (see Figure 4). And there is even greater differences seen between exercisers and non-exercisers (see Figure 5).

In evaluating process of change, stages 1 (pre-contemplation) and 4 (action) were omitted for the analysis, hence only three stages were evaluated. Counter conditioning, or the use of physical activity to relax, to improve how one feels, and to relieve tension and worries, was the only significant discriminator between stages 5 (action) and 2 (contemplation). Marcus, Rossi, et al. (1992) found that most processes except counter conditioning and reinforcement management peaked in the action stage (Figure 6). The found that counterconditioning and reinforcement management were used most in the maintenance stage. However all the other eight processes were still used more in the maintenance stage than in preparation, contemplation and pre-contemplation. Pre-contemplation has the lowest use of these processes with each stage successively building on the last stage until they peak in action with the exception of counter conditioning and reinforcement management (only a slight increase) (Marcus, Rossi, et al., 1992).

In looking at the trends found in this study, stages 1 and 4 were re-included to make a graph of the use of processes (Figure 7). Using pooled variances to adjust for differences in sample sizes, T-tests were done on each process in each of the three stages (2,3,& 5) between means found by Marcus, Rossi et al. (1992) and means found in this study. No significant differences were found. The one individual in action is clearly using all 10 processes more than the previous stage and then these fall off in the maintenance stage. Two of the processes that should still be greater in maintenance than in preparation are lower than expected, but overall, those in action are greater than, or close to the levels found in preparation. Those two found to be lower than expected (although not significantly) are dramatic relief (worrying about the harmful effects of inactivity) and self reevaluation (reappraisal of the values associated with exercise - or being a better person because of exercise). It is possible that having a chronic disease that requires daily and sometimes hourly management to maintain a normal blood glucose alters the use of

the processes in the maintenance stage. Again, a larger sample with greater power could have shown trends more clearly.

As hypothesized, physical activity, as measured by days per week of moderate activity of 20 minutes, did increase significantly through the stages (see Figure 8). The telephone survey did identify other activities such as raking, mopping, vacuuming, that are considered moderate and similar to a brisk walk. Those in stages 1 and 2 who did not report exercise on the mailed survey, did participate in activity, although not as many days per week as those in the higher stages. The difference between exercisers and non-exercisers was even more pronounced (see Figure 9). This activity, however may contribute to changes in HgA1C and cholesterol. Schneider (1984) showed significant decrease in blood glucose 12 hours after exercise and a decrease in HgA1C after six weeks of training. Barnard et al. (1991) and Bourn (1994) showed improvement of lipid panels with regular exercise. In evaluating Kcalories per Kg per day, obtained from the telephone survey, there is an upward trend from stages 2 through 5 (see Figure 10). In a larger sample with less intensive medical regimens, this trend could be significant.

Self-efficacy did not differentiate between the stages and it did not correlate with the stages. In this sample those in contemplation were highest in self-efficacy, followed by maintainers, then preparers. This may be explained by the fact that all subjects were volunteers and the small group sizes could not show appropriate trends. Marcus, Selby, et al. (1992) found that self-efficacy was highest in the maintenance stage and lowest in the pre-contemplation stage with the middle stages being fairly equal (see Figure 11). In this study, the individual in stage 4 had extremely low self-efficacy which was unexpected (see Figure 12). Those in contemplation had unexpectedly high levels of self-efficacy. The standard deviation was very wide among this group ($\underline{n}$=6) and those in maintenance ($\underline{n}$=13) were more tightly grouped (see Figure 13). The sample size in stage 2 was too small with too much variance to be considered. Skelly et al. (1995) found that the influence of self-efficacy over exercise diminished over time. The two studies by Marcus and Owen (1992), done in the U.S. and Australia, yielded mixed results regarding self-efficacy's ability to differentiate the stages. Prochaska and Marcus (1994), stated that increased self-

efficacy in the lower stages causes an increased use of the appropriate change processes. As self-efficacy increases in the later stages, the processes of change are used less, indicating a nearing of the termination of the change. This group of persons with diabetes have mastered glucose monitoring, insulin injections or other anti-diabetic medications, and have learned to live with a disease that requires daily management. Perhaps these people have developed a high level of general-self-efficacy which influenced exercise-self-efficacy in those who were debating the start of an exercise program (precontemplation).

Implications and recommendations

This study showed promising trends toward improved control as persons progress in stage of exercise adoption. Unfortunately the very small group sizes limited the analysis. Also the fact that so many patients were on intensive therapy, due to being drawn from the diabetes clinic, may have clouded the effect of exercise adoption on HgA1C and cholesterol to HDL levels. Measuring income and education levels and family/community commitments could also provide additional information about the population and issues that encourage or prevent exercise adoption. An interesting follow-up to this study would be to measure how quickly those with high self-efficacy advance to the next stage versus those with lower self-efficacy. A larger study with larger groups of persons in each stage, recruited from different practice settings, including minorities and differentiating those with Type 1 and Type 2 would be valuable. Also measuring the type and frequency of healthcare visits could prove important. A longitudinal study combined with an intervention component using a control group and measuring the stages and processes at 6, 12, and 18 months would identify those that relapse as well as those who maintain and move forward over time.

Identifying the patient's stage of exercise adoption is extremely important. But prior to initiating an exercise program, all persons with diabetes should have their cardiac status evaluated (American College of Sports Medicine, 1995). Stage of exercise adoption and physical activity patterns should be a part of each assessment. Just as with smoking habits, the healthcare provider may be able to influence the adoption of a healthier life style or the letting go of a sedentary life style. Stages of exercise adoption can

easily be accomplished without extensive surveys, using a ladder with statements assigned to 5 rungs in ascending order (Cardinal, 1995; Marcus, Pinto, et al., 1994; Marcus, Rakowski, et al., 1992). This assessment allows the clinician to tailor an intervention of education and encouragement that matches the patient's particular stage of exercise adoption. Prochaska and Marcus (1994) warn of the dangers in helping "a sedentary population with action-oriented interventions" (p. 166). If the intervention is designed for someone ready for action, those in precontemplation will not be interested and those in contemplation may feel they will never get there. Taking the time to provide interventions is expensive, yet important to the promotion of a more active life style which could improve the overall health of the patient. Additional study is necessary to determine the efficacy of stage matched interventions. Failing to provide any intervention or providing the wrong interventions could prevent advancement or lead unnecessarily to relapse.

In this study, a more active life-style correlated with lower BMI and cholesterol to HDL ratios. Although exercise did not prove significant in blood glucose control, trends were indicated and this has been demonstrated in other studies (Barnard et al., 1994; Bourn et al., 1994; Schneider et al., 1984). A larger study with increased power could show significant trends. As healthcare dollars become scarce, prevention of long-term complications in diabetes becomes important. Exercise is an important aspect in the treatment plan for diabetes. Identifying the stage of exercise adoption and providing appropriate interventions can move patients into the next stage of exercise adoption.

Table 1
Frequency - Stage of Exercise

STAGE

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	3.6	3.6	3.6
	2	6	21.4	21.4	25.0
	3	5	17.9	17.9	42.9
	4	1	3.6	3.6	46.4
	5	15	53.6	53.6	100.0
	Total	28	100.0	100.0	
Total		28	100.0		

Table 2

Means and ANOVA - Age, Diagnostic Age to Stage of Exercise

Stage 1=precontemplation + contemplation

Stage 2=preparation

Stage 3=action + maintenance

Descriptives

			N	Mean	Std. Deviation
AGE	STAGE3	1	7	56.43	12.87
		2	5	46.60	9.40
		3	16	63.31	8.14
		Total	28	58.61	11.30
DXAGE	STAGE3	1	7	44.286	5.992
		2	5	40.200	8.349
		3	16	56.688	7.282
		Total	28	50.643	10.004

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
AGE	Between Groups	1108.327	2	554.163	5.920	.008
	Within Groups	2340.352	25	93.614		
	Total	3448.679	27			
DXAGE	Between Groups	1412.762	2	706.381	13.693	.000
	Within Groups	1289.666	25	51.587		
	Total	2702.429	27			

Multiple Comparisons

Tukey HSD

Dependent Variable	(I) STAGE3	(J) STAGE3	Mean Difference (I-J)	Std. Error	Sig.
AGE	1	2	9.83	5.665	.212
		3	-6.88	4.385	.277
	2	1	-9.83	5.665	.212
		3	-16.71*	4.957	.007
	3	1	6.88	4.385	.277
		2	16.71*	4.957	.007
DXAGE	1	2	4.086	4.206	.601
		3	-12.402*	3.255	.002
	2	1	-4.086	4.206	.601
		3	-16.487*	3.680	.000
	3	1	12.402*	3.255	.002
		2	16.487*	3.680	.000

*. The mean difference is significant at the .05 level.

Table 3
Means and T-Test - Age, Diagnostic Age in Exercisers and Non-exercisers

Group Statistics

	exercise status	N	Mean	Std. Deviation	Std. Error Mean
AGE	no regular exercise	12	52.33	12.17	3.51
	exercises regularly	16	63.31	8.14	2.03
DXAGE	no regular exercise	12	42.583	7.025	2.028
	exercises regularly	16	56.688	7.282	1.821

Independent Samples Test

		t-test for Equality of Means				
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
AGE	Equal variances assumed	-2.863	26	.008	-10.98	3.84
	Equal variances not assumed	-2.705	18.123	.014	-10.98	4.06
DXAGE	Equal variances assumed	-5.148	26	.000	-14.104	2.740
	Equal variances not assumed	-5.175	24.300	.000	-14.104	2.725

Table 4
Means and T-Test - Meal Plan Adoption in Exercisers and Non-exercisers

Group Statistics

	exercise status	N	Mean	Std. Deviation	Std. Error Mean
Percent of time meal plan is followed	exercises regularly	15	3.33	1.18	.30
	no regular exercise	10	2.20	1.62	.51

Independent Samples Test

		t-test for Equality of Means				
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Percent of time meal plan is followed	Equal variances assumed	2.032	23	.054	1.13	.56
	Equal variances not assumed	1.904	15.223	.076	1.13	.60

Table 5
Frequency - Type of Exercise

type of exercise

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	walking	7	25.0	35.0	35.0
	walk/bike	1	3.6	5.0	40.0
	swim/bike/treadmill/st airmaster	2	7.1	10.0	50.0
	walk/dance	2	7.1	10.0	60.0
	walk/bike/universal machine	2	7.1	10.0	70.0
	swimming	1	3.6	5.0	75.0
	walk/swim	2	7.1	10.0	85.0
	walk/weighlifting	2	7.1	10.0	95.0
	walk/nordic track	1	3.6	5.0	100.0
	Total	20	71.4	100.0	
Missing	99	8	28.6		
	Total	8	28.6		
Total		28	100.0		

Table 6
Frequency - Reasons Patient is Not Exercising Now

reasons patient is not exercising now

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	too much work	1	3.6	9.1	9.1
	no place to exercise	2	7.1	18.2	27.3
	back and/or knee problems	2	7.1	18.2	45.5
	time	2	7.1	18.2	63.6
	unable to walk long distances	1	3.6	9.1	72.7
	inconvenient and expensive	1	3.6	9.1	81.8
	arthritis	1	3.6	9.1	90.9
	out of habit	1	3.6	9.1	100.0
	Total	11	39.3	100.0	
Missing	99	17	60.7		
	Total	17	60.7		
Total		28	100.0		

Table 7
Frequency - Reasons Patient stopped Exercise in the Past

reasons stopped exercise in past

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	time	1	3.6	10.0	10.0
	no committment	1	3.6	10.0	20.0
	club membership expired/left area	2	7.1	20.0	40.0
	illness	1	3.6	10.0	50.0
	pain	3	10.7	30.0	80.0
	time and illness	1	3.6	10.0	90.0
	time and weather and low energy	1	3.6	10.0	100.0
	Total	10	35.7	100.0	
Missing	99	18	64.3		
	Total	18	64.3		
Total		28	100.0		

Table 8
Frequency - Complications

complications

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	none	3	10.7	15.0	15.0
	peripheral nerve damage	3	10.7	15.0	30.0
	high blood pressure	6	21.4	30.0	60.0
	eye and peripheral nerve	2	7.1	10.0	70.0
	eye and blood pressure	1	3.6	5.0	75.0
	peripheral nerve and autonomic nerve	1	3.6	5.0	80.0
	peripheral nerve and high blood pressure	1	3.6	5.0	85.0
	eye, peripheral nerve and high blood pressure	1	3.6	5.0	90.0
	all complications and high blood pressure	1	3.6	5.0	95.0
	high blood pressure and heart disease	1	3.6	5.0	100.0
	Total	20	71.4	100.0	
Missing	99	8	28.6		
	Total	8	28.6		
Total		28	100.0		

Table 9
Means and ANOVA - HgA1C to Stage of Exercise

```
Stage 1 = precontemplation + contemplation
Stage 2 = preparation
Stage 3 = action + maintenance
```

Descriptives

			N	Mean	Std. Deviation	Std. Error
HGA1C	STAGE3	1	7	9.743	3.942	1.490
		2	5	7.300	.992	.444
		3	16	7.306	1.070	.267
		Total	28	7.914	2.322	.439

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
HGA1C	Between Groups	31.208	2	15.604	3.412	.049
	Within Groups	114.347	25	4.574		
	Total	145.554	27			

Multiple Comparisons

Dependent Variable: HGA1C
Tukey HSD

(I) STAGE3	(J) STAGE3	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1	2	2.443	1.252	.146	-.676	5.562
	3	2.437*	.969	.048	2.258E-02	4.851
2	1	-2.443	1.252	.146	-5.562	.676
	3	-6.250E-03	1.096	1.000	-2.736	2.723
3	1	-2.437*	.969	.048	-4.851	-2.26E-02
	2	6.250E-03	1.096	1.000	-2.723	2.736

*. The mean difference is significant at the .05 level.

Table 10
ANOVA - HgA1C to Stage of Exercise, Controlling for Intensive Medical Therapy

Case Processing Summary[a]

Cases					
Included		Excluded		Total	
N	Percent	N	Percent	N	Percent
28	100.0%	0	.0%	28	100.0%

a. HGA1C by STAGE3 with intensive therapy

ANOVA[a,b]

HGA1C		Unique Method				
		Sum of Squares	df	Mean Square	F	Sig.
Covariates	intensive therapy	.845	1	.845	.179	.676
Main Effects	STAGE3	30.834	2	15.417	3.260	.056
Model		32.053	3	10.684	2.259	.107
Residual		113.501	24	4.729		
Total		145.554	27	5.391		

a. HGA1C by STAGE3 with intensive therapy

b. All effects entered simultaneously

Table 11

Frequency - Intensive Anti-Diabetic Medical Therapy in Exercisers and Non-exercisers

intensive therapy * exercise status

Crosstab

			exercise status		
			no regular exercise	exercises regularly	Total
intensive therapy	conventional	Count	2	7	9
		% within intensive therapy	22.2%	77.8%	100.0%
		% within exercise status	16.7%	43.8%	32.1%
	intensive	Count	10	9	19
		% within intensive therapy	52.6%	47.4%	100.0%
		% within exercise status	83.3%	56.3%	67.9%
Total		Count	12	16	28
		% within intensive therapy	42.9%	57.1%	100.0%
		% within exercise status	100.0%	100.0%	100.0%

Table 12
Frequency - Intensive Anti-Diabetic Medical Therapy for Stage of Exercise

intensive therapy * STAGE

Crosstab

			STAGE			
			1	2	3	4
intensive therapy	conventional	Count		2		
		% within intensive therapy		22.2%		
		% within STAGE		33.3%		
	intensive	Count	1	4	5	1
		% within intensive therapy	5.3%	21.1%	26.3%	5.3%
		% within STAGE	100.0%	66.7%	100.0%	100.0%
Total		Count	1	6	5	1
		% within intensive therapy	3.6%	21.4%	17.9%	3.6%
		% within STAGE	100.0%	100.0%	100.0%	100.0%

			STAGE	
			5	Total
intensive therapy	conventional	Count	7	9
		% within intensive therapy	77.8%	100.0%
		% within STAGE	46.7%	32.1%
	intensive	Count	8	19
		% within intensive therapy	42.1%	100.0%
		% within STAGE	53.3%	67.9%
Total		Count	15	28
		% within intensive therapy	53.6%	100.0%
		% within STAGE	100.0%	100.0%

Table 13
Pearson Correlation - HgA1C, Cholesterol-HDL, and BMI

Correlations

		BMI	HGA1C	CHOHDL
Pearson Correlation	BMI	1.000	.443*	.512*
	HGA1C	.443*	1.000	.160
	CHOHDL	.512*	.160	1.000
Sig. (2-tailed)	BMI	.	.018	.015
	HGA1C	.018	.	.476
	CHOHDL	.015	.476	.
N	BMI	28	28	22
	HGA1C	28	28	22
	CHOHDL	22	22	22

*. Correlation is significant at the 0.05 level (2-tailed).

Table 14

Means and ANOVA - BMI to Stage of Exercise

Stage 1 = precontemplation + contemplation
Stage 2 = preparation
Stage 3 = action + maintenance

Descriptives

			N	Mean	Std. Deviation	Std. Error
BMI	STAGE3	1	7	37.5548	5.6994	2.1542
		2	5	40.8514	5.0375	2.2528
		3	16	28.6649	5.1985	1.2996
		Total	28	33.0635	7.3429	1.3877

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
BMI	Between Groups	754.027	2	377.013	13.431	.000
	Within Groups	701.767	25	28.071		
	Total	1455.794	27			

Multiple Comparisons

Dependent Variable: BMI
Tukey HSD

(I) STAGE3	(J) STAGE3	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1	2	-3.2967	3.102	.545	-11.0240	4.4306
	3	8.8899*	2.401	.003	2.9095	14.8702
2	1	3.2967	3.102	.545	-4.4306	11.0240
	3	12.1866*	2.715	.000	5.4252	18.9480
3	1	-8.8899*	2.401	.003	-14.8702	-2.9095
	2	-12.1866*	2.715	.000	-18.9480	-5.4252

*. The mean difference is significant at the .05 level.

Table 15

Means and T-Test - BMI, Days of Exercise, and Cholesterol - HDL Ratio

	exercise status	N	Mean	Std. Deviation	Std. Error Mean
BMI	no regular exercise	12	38.9284	5.4615	1.5766
	exercises regularly	16	28.6649	5.1985	1.2996
CHOHDL	no regular exercise	9	6.5629	1.0844	.3615
	exercises regularly	13	5.0848	1.5079	.4182
DYSEXERC	no regular exercise	5	2.300	.570	.255
	exercises regularly	16	5.156	1.720	.430
EXERDAYS	no regular exercise	9	3.11	2.32	.77
	exercises regularly	14	5.71	1.07	.29

		t-test for Equality of Means				
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
BMI	Equal variances assumed	5.060	26	.000	10.2635	2.0283
	Equal variances not assumed	5.023	23.180	.000	10.2635	2.0432
CHOHDL	Equal variances assumed	2.517	20	.020	1.4781	.5873
	Equal variances not assumed	2.674	19.937	.015	1.4781	.5528
DYSEXERC	Equal variances assumed	-3.596	19	.002	-2.856	.794
	Equal variances not assumed	-5.714	18.722	.000	-2.856	.500
EXERDAYS	Equal variances assumed	-3.674	21	.001	-2.60	.71
	Equal variances not assumed	-3.163	10.225	.010	-2.60	.82

Table 16

Nonparametric Correlations - Kendall's Tau Correlation of BMI, HgA1c, cholesterol - HDL Ratio Days of Exercise, Kcals used per Telephone Report, and Stage of Exercise

		BMI	HGA1C	CHOHDL	DYSEXERC	EXERDAYS
Correlation Coefficient	BMI	1.000	.122	.443**	-.336*	-.345*
	HGA1C	.122	1.000	.110	-.358*	-.242
	CHOHDL	.443**	.110	1.000	-.248	-.267
	DYSEXERC	-.336*	-.358*	-.248	1.000	.337
	EXERDAYS	-.345*	-.242	-.267	.337	1.000
	TELEKCAL	.594**	.210	.399*	-.104	-.228
	STAGE3	-.540**	-.241	-.470**	.569**	.527**
Sig. (2-tailed)	BMI	.	.372	.004	.040	.030
	HGA1C	.372	.	.479	.033	.134
	CHOHDL	.004	.479	.	.199	.141
	DYSEXERC	.040	.033	.199	.	.080
	EXERDAYS	.030	.134	.141	.080	.
	TELEKCAL	.000	.168	.021	.563	.151
	STAGE3	.000	.122	.007	.003	.004
N	BMI	28	28	22	21	23
	HGA1C	28	28	22	21	23
	CHOHDL	22	22	22	16	18
	DYSEXERC	21	21	16	21	18
	EXERDAYS	23	23	18	18	23
	TELEKCAL	23	23	18	18	23
	STAGE3	28	28	22	21	23

			TELEKCAL	STAGE3
Kendall's tau_b	Correlation Coefficient	BMI	.594**	-.540**
		HGA1C	.210	-.241
		CHOHDL	.399*	-.470**
		DYSEXERC	-.104	.569**
		EXERDAYS	-.228	.527**
		TELEKCAL	1.000	-.468**
		STAGE3	-.468**	1.000
	Sig. (2-tailed)	BMI	.000	.000
		HGA1C	.168	.122
		CHOHDL	.021	.007
		DYSEXERC	.563	.003
		EXERDAYS	.151	.004
		TELEKCAL	.	.006
		STAGE3	.006	.
	N	BMI	23	28
		HGA1C	23	28
		CHOHDL	18	22
		DYSEXERC	18	21
		EXERDAYS	23	23
		TELEKCAL	23	23
		STAGE3	23	28

**. Correlation is significant at the .01 level (2-tailed).

*. Correlation is significant at the .05 level (2-tailed).

Table 17

ANOVA - cholesterol-HDL Ratio to Stage of Exercise, Controlling for Lipid Lowering Agents

Case Processing Summary[a]

Cases					
Included		Excluded		Total	
N	Percent	N	Percent	N	Percent
22	78.6%	6	21.4%	28	100.0%

a. CHOHDL by STAGE3 with LIPODRG

ANOVA[a,b]

CHOHDL		Unique Method				
		Sum of Squares	df	Mean Square	F	Sig.
Covariates	LIPODRG	.134	1	.134	.066	.800
Main Effects	STAGE3	11.618	2	5.809	2.877	.082
Model		11.970	3	3.990	1.976	.154
Residual		36.341	18	2.019		
Total		48.312	21	2.301		

a. CHOHDL by STAGE3 with LIPODRG

b. All effects entered simultaneously

Table 18

ANOVA - Cholesterol, HDL, and Cholesterol-HDL Ratio to Stage of Exercise

			N	Mean	Std. Deviation	Std. Error
CHOL	STAGE3	1	6	211.33	29.48	12.04
		2	4	216.50	19.33	9.67
		3	13	199.85	22.73	6.31
		Total	23	205.74	24.09	5.02
HDL	STAGE3	1	6	32.67	8.48	3.46
		2	3	33.67	4.93	2.85
		3	13	42.00	11.55	3.20
		Total	22	38.32	10.79	2.30
CHOHDL	STAGE3	1	6	6.6726	1.1346	.4632
		2	3	6.3435	1.1737	.6776
		3	13	5.0848	1.5079	.4182
		Total	22	5.6895	1.5168	.3234

ANOVA		Sum of Squares	df	Mean Square	F	Sig.
CHOL	Between Groups	1102.409	2	551.205	.945	.405
	Within Groups	11668.026	20	583.401		
	Total	12770.435	22			
HDL	Between Groups	432.773	2	216.386	2.045	.157
	Within Groups	2010.000	19	105.789		
	Total	2442.773	21			
CHOHDL	Between Groups	11.836	2	5.918	3.083	.069
	Within Groups	36.475	19	1.920		
	Total	48.312	21			

Tukey HSD Dependent Variable	(I) STAGE3	(J) STAGE3	Mean Difference (I-J)	Std. Error	Sig.
CHOL	1	2	-5.17	15.591	.941
		3	11.49	11.921	.608
	2	1	5.17	15.591	.941
		3	16.65	13.810	.464
	3	1	-11.49	11.921	.608
		2	-16.65	13.810	.464
HDL	1	2	-1.00	7.273	.990
		3	-9.33	5.076	.184
	2	1	1.00	7.273	.990
		3	-8.33	6.588	.431
	3	1	9.33	5.076	.184
		2	8.33	6.588	.431
CHOHDL	1	2	.3292	.980	.940
		3	1.5878	.684	.077
	2	1	-.3292	.980	.940
		3	1.2587	.887	.352
	3	1	-1.5878	.684	.077
		2	-1.2587	.887	.352

Table 19
ANOVA - Counterconditioning to Stage of Exercise

Descriptives

			N	Mean	Std. Deviation	Std. Error
CC	stage	contemplation	6	1.7917	.4587	.1873
		preparation	5	2.7500	.5000	.2236
		maintenance	13	3.7692	1.0775	.2989
		Total	24	3.0625	1.1916	.2432

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
CC	Between Groups	16.671	2	8.336	10.951	.001
	Within Groups	15.985	21	.761		
	Total	32.656	23			

Dependent Variable: CC
Tukey HSD

(I) stage	(J) stage	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
contemplation	preparation	-.9583	.528	.189	-2.2900	.3733
	maintenance	-1.9776*	.431	.000	-3.0629	-.8922
preparation	contemplation	.9583	.528	.189	-.3733	2.2900
	maintenance	-1.0192	.459	.091	-2.1765	.1380
maintenance	contemplation	1.9776*	.431	.000	.8922	3.0629
	preparation	1.0192	.459	.091	-.1380	2.1765

*. The mean difference is significant at the .05 level.

Table 20

Means and ANOVA - Physical Activity to Stage of Exercise

			N	Mean	Std. Deviation	Std. Error
DYSEXERC	STAGE3	1	0	.	.	.
		2	5	2.300	.570	.255
		3	16	5.156	1.720	.430
		Total	21	4.476	1.959	.427
EXERDAYS	STAGE3	1	5	2.60	2.51	1.12
		2	4	3.75	2.22	1.11
		3	14	5.71	1.07	.29
		Total	23	4.70	2.08	.43
KALPERKG	STAGE3	1	5	33.3040	2.1006	.9394
		2	4	33.7050	2.2789	1.1394
		3	14	37.9071	7.6574	2.0465
		Total	23	36.1757	6.4071	1.3360

ANOVA		Sum of Squares	df	Mean Square	F	Sig.
DYSEXERC	Between Groups	31.079	1	31.079	12.933	.002
	Within Groups	45.659	19	2.403		
	Total	76.738	20			
EXERDAYS	Between Groups	40.062	2	20.031	7.310	.004
	Within Groups	54.807	20	2.740		
	Total	94.870	22			
KALPERKG	Between Groups	107.621	2	53.811	1.353	.281
	Within Groups	795.489	20	39.774		
	Total	903.111	22			

Tukey HSD Dependent Variable	(I) STAGE3	(J) STAGE3	Mean Difference (I-J)	Std. Error	Sig.
EXERDAYS	1	2	-1.15	1.110	.564
		3	-3.11*	.862	.005
	2	1	1.15	1.110	.564
		3	-1.96	.939	.117
	3	1	3.11*	.862	.005
		2	1.96	.939	.117
KALPERKG	1	2	-.4010	4.231	.995
		3	-4.6031	3.286	.359
	2	1	.4010	4.231	.995
		3	-4.2021	3.576	.481
	3	1	4.6031	3.286	.359
		2	4.2021	3.576	.481

*. The mean difference is significant at the .05 level.

Table 21

Means for Self-Efficacy by Stage of Exercise and in Exercisers and Non-exercisers

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
SE * stage	23	82.1%	5	17.9%	28	100.0%
SE * exercise status	25	89.3%	3	10.7%	28	100.0%

SE * stage

SE

contemplation	Mean	102.0000
	N	6
	Std. Deviation	26.5631
preparation	Mean	83.0000
	N	4
	Std. Deviation	9.4516
maintenance	Mean	99.6923
	N	13
	Std. Deviation	29.1072
Total	Mean	97.3913
	N	23
	Std. Deviation	26.1007

SE * exercise status

SE

no regular exercise	Mean	90.3636
	N	11
	Std. Deviation	25.4058
exercises regularly	Mean	96.1429
	N	14
	Std. Deviation	30.9587
Total	Mean	93.6000
	N	25
	Std. Deviation	28.2253

Figure 1
Mean Age to Stage of Exercise (Collapsed Model)

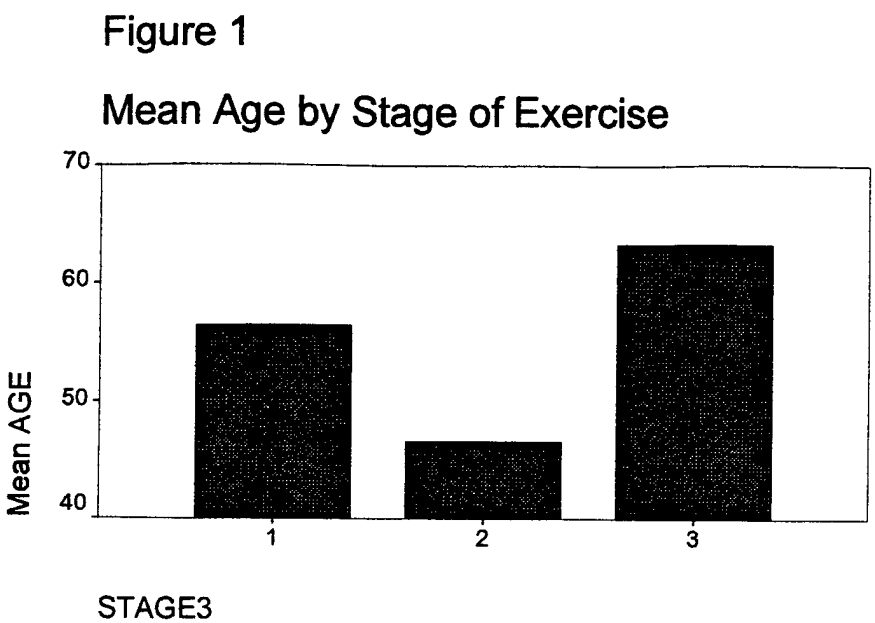


Figure 2
Mean BMI and Age by Stage of Exercise (Collapsed Model) and Exercise Status

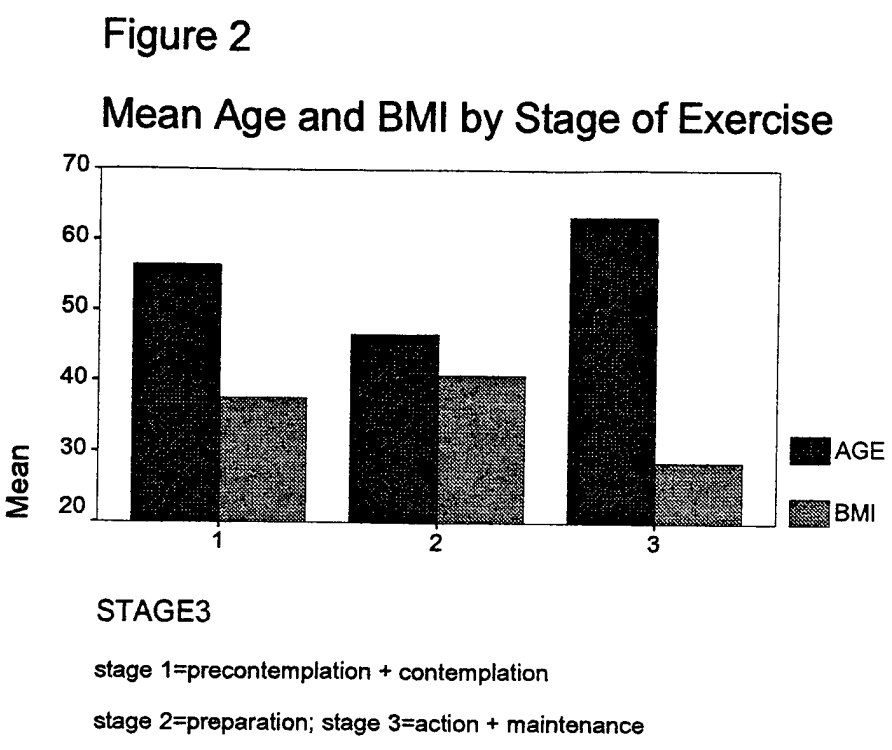


Figure 3
Mean Age and BMI in Exercisers and Non-exercisers

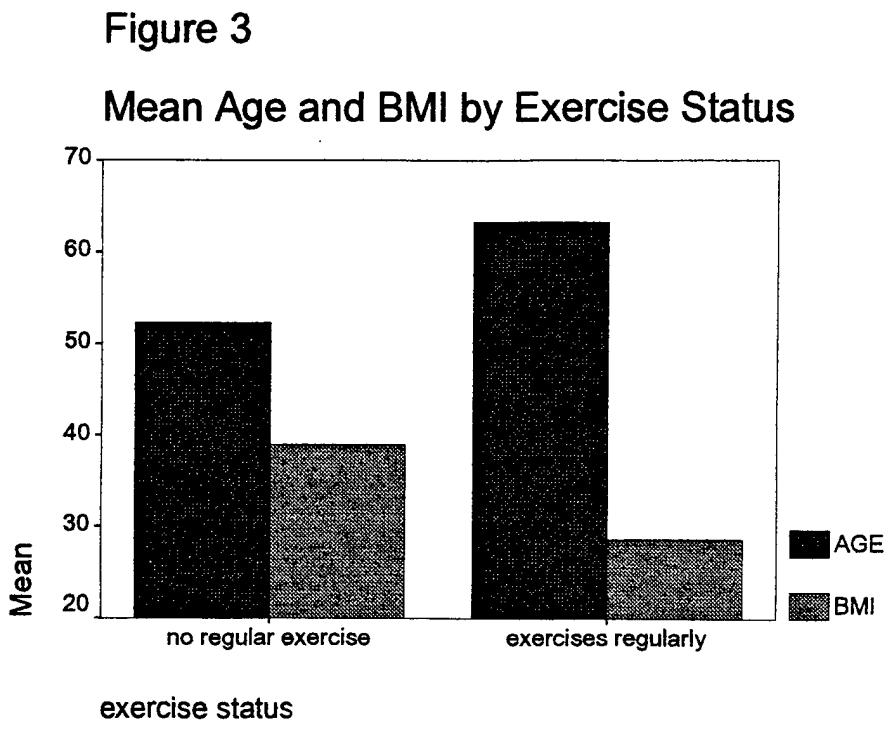
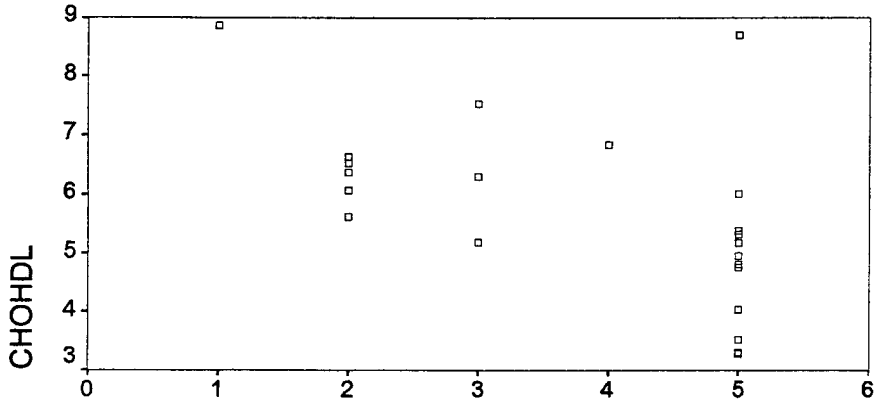


Figure 4
Cholesterol-HDL Ratio by Stage of Exericse

Figure 4

Cholesterol - HDL Ratio by Stage of Exercise



STAGE

stage 1=precontemplation ; stage 2=contemplation

stage 3=preparation; stage 4=action; stage 5=maintenance

Figure 5
Mean HgA1C and Cholesterol-HDL Ratio by Stage of Exercise (Collapsed Model)

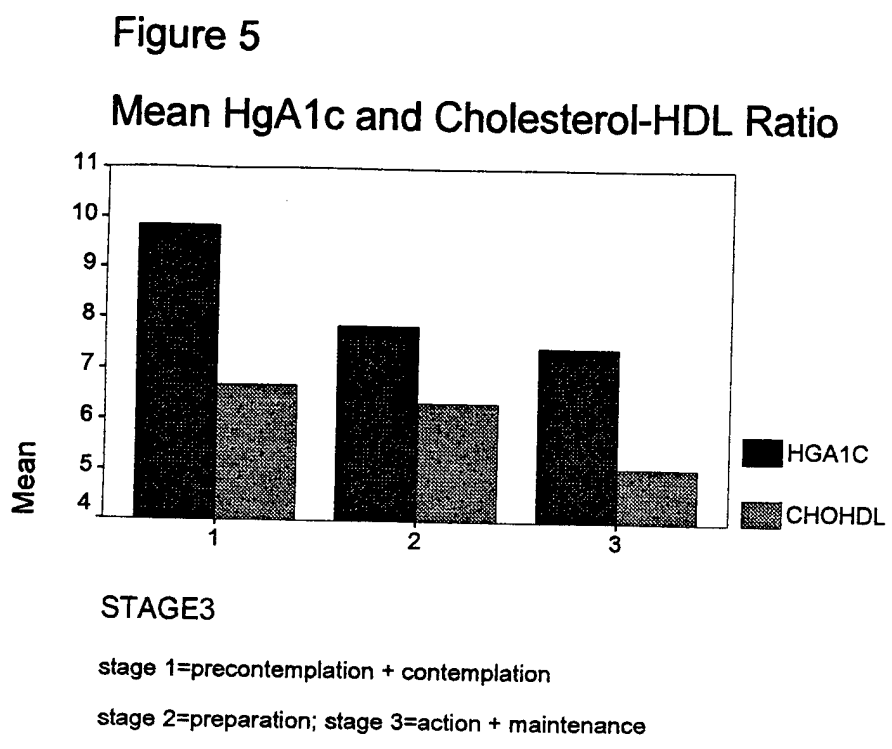


Figure 6
Mean - HgA1C and Cholesterol - HDL Ratio by Exercise Status

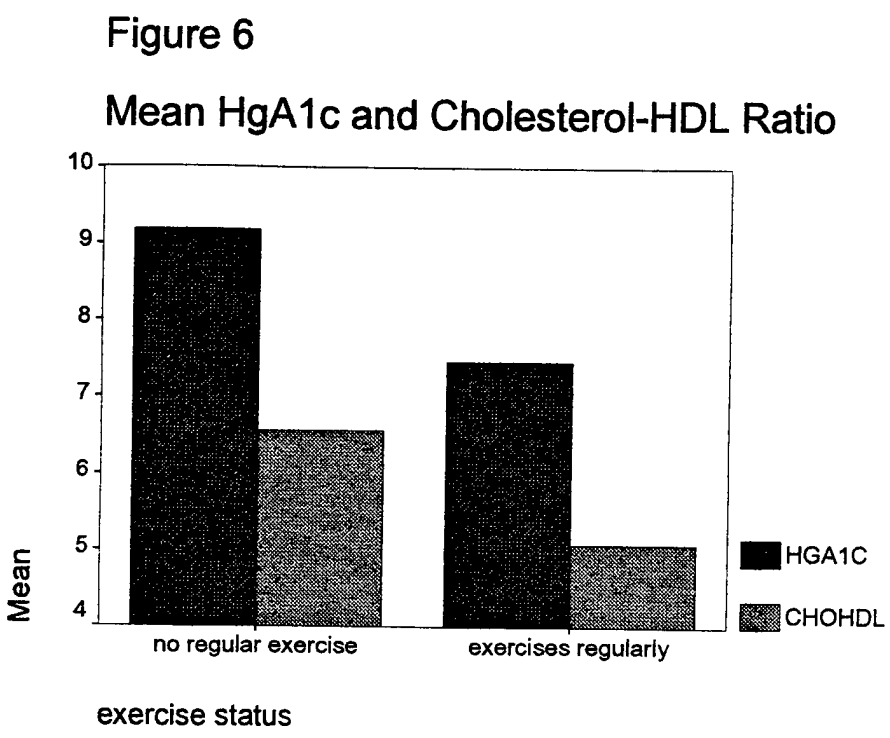


Figure 7
Mean Process of change scores by Stage of Exercise. Adopted from Marcus, Rossi, et al. (1992)

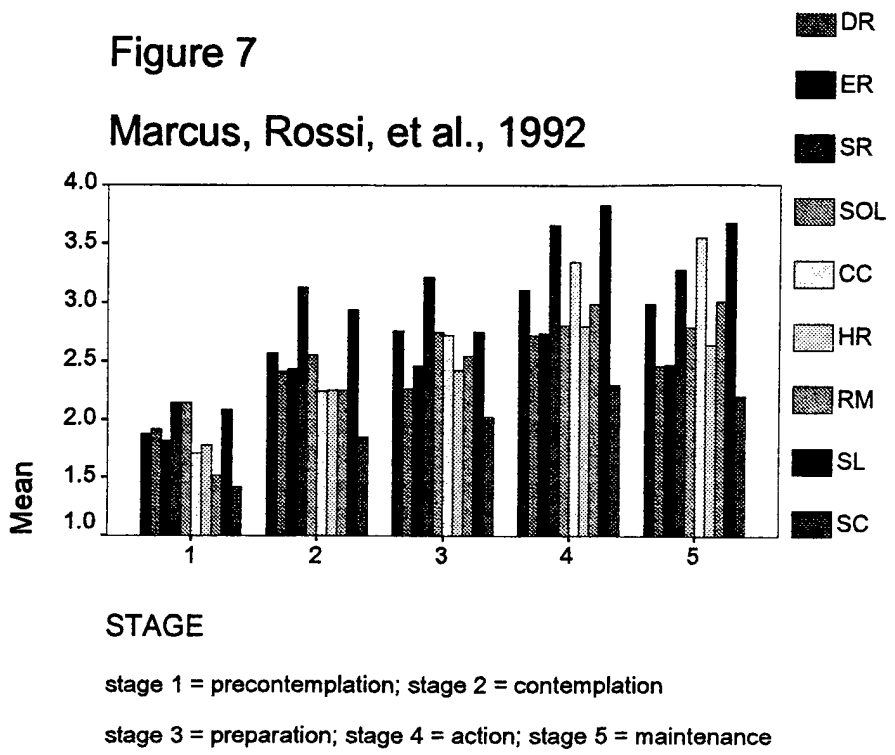


Figure 8
Mean Process of change Scores by Stage of Exercise

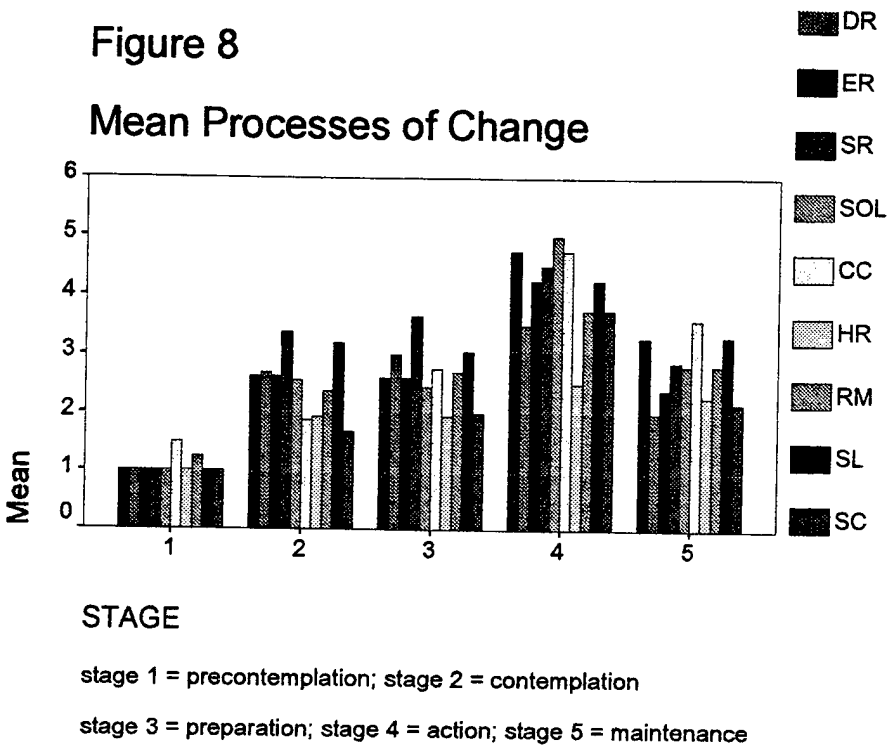


Figure 9
Mean Days of Exercise by Stage of Exercise

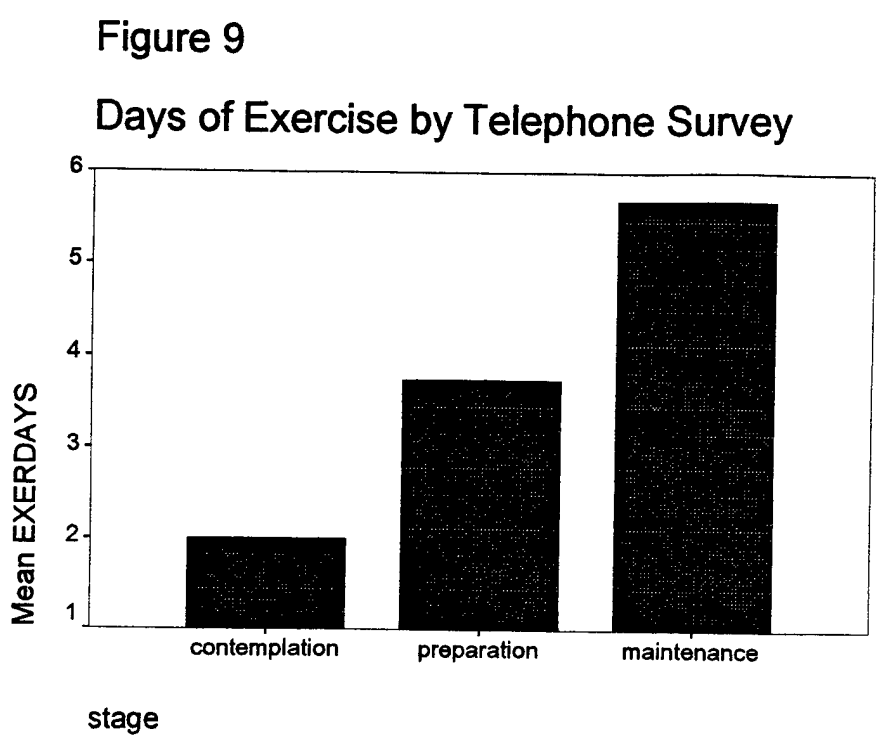


Figure 10
Mean Days of Exercise by Exercise Status

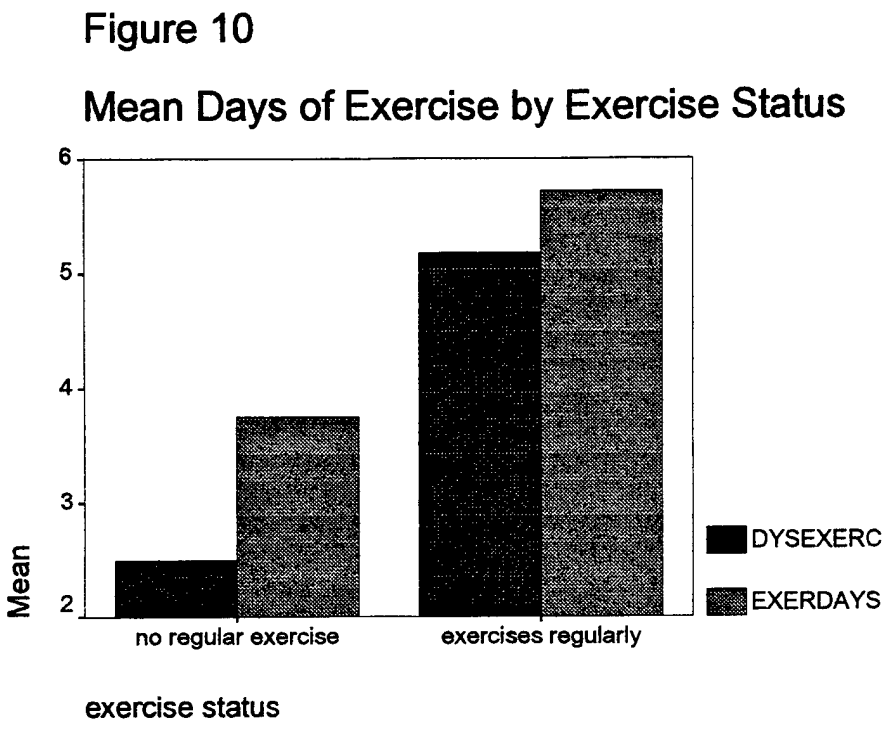


Figure 11
Individuals' Kcalories per Kilogram used by Stage of Exercise

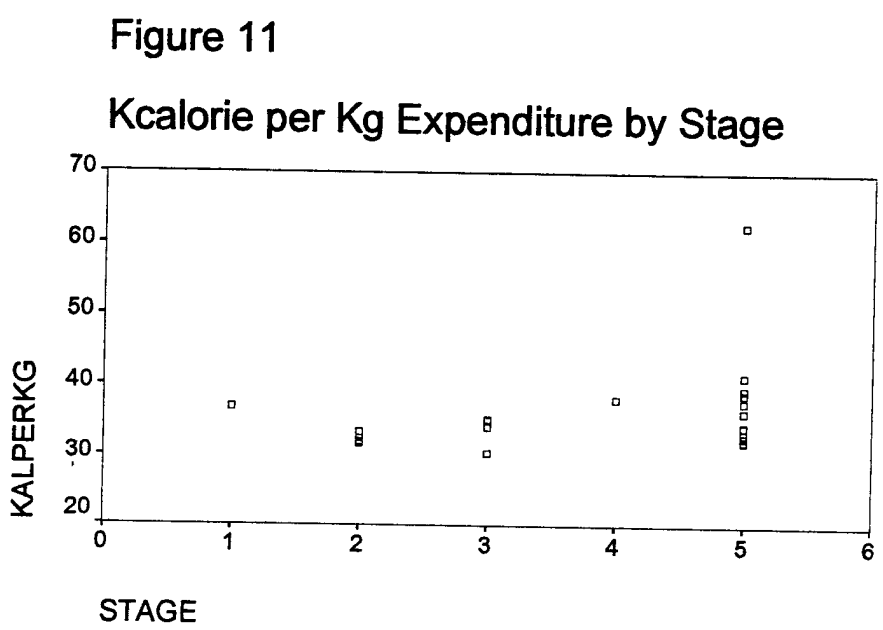
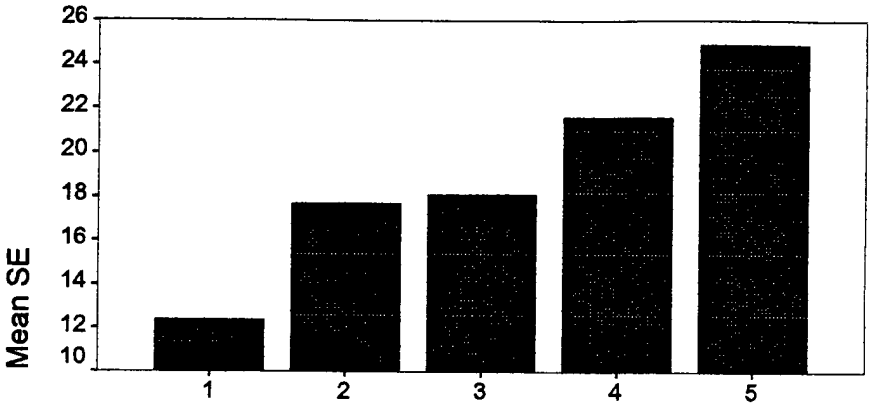


Figure 12
Mean Self-Efficacy Scores by Stage of Exercise -- Adapted from Marcus and Owen (1992)

Figure 12

Self-Efficacy Scores - Marcus & Owen, 1992



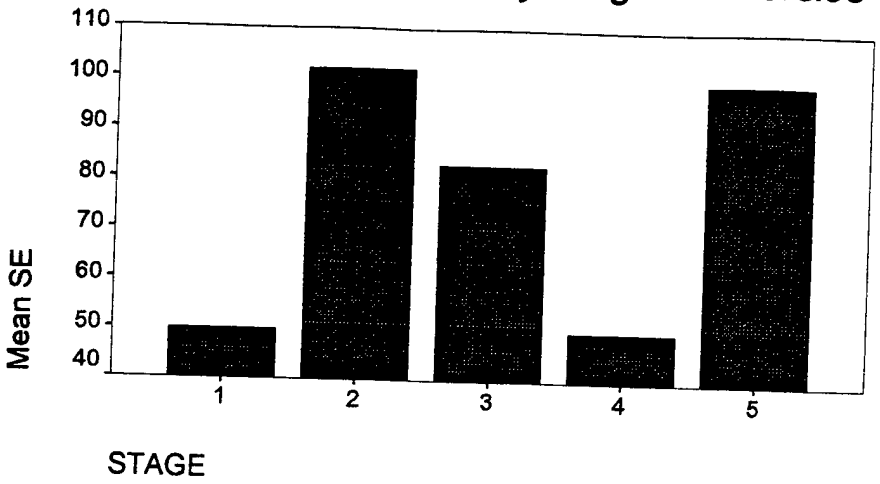
stage 1=precontemplation + contemplation

stage 2=preparation; stage 3=action + maintenance

Figure 13
Mean Self-Efficacy Scores by Stage of Exercise

Figure 13

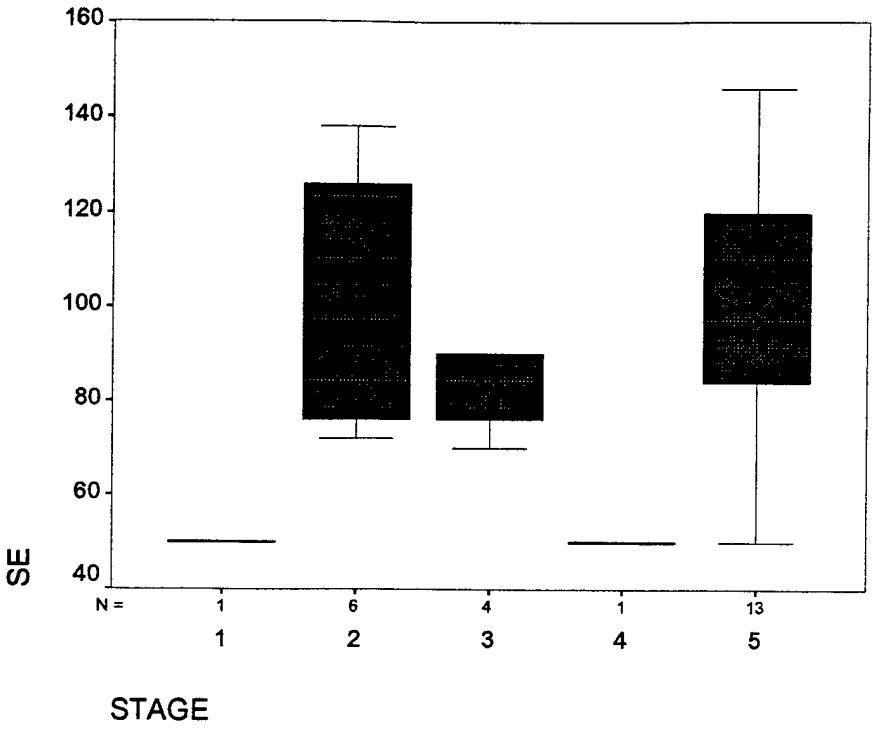
Self-Efficacy Scores by Stage of Exercise



stage 1=precontemplation; stage 2=contemplation

stage 3=preparation; stage 4=action; stage 5=maintenance

Figure 14
Boxplot of Self-Efficacy Scores by Stage of Exercise



stage 1=precontemplation; stage 2=contemplation; stage3=preparation, stage 4=action; stage 5=maintenance

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EXERCISE STAGES OF CHANGE QUESTIONNAIRE

In the following questions, EXERCISE is defined as any physical activity such as: walking, jogging, swimming, aerobic dancing, aerobic step programs, low impact aerobic programs, biking, rowing, etc.
***REGULAR EXERCISE** is defined as doing any physical activity as described above 3 or more times per week for 20 minutes or longer. In the questionnaire, when you see *, this refers to the definition of exercise and this explanation of regular exercise. Activities that are primarily sedentary such as bowling, playing golf with a golf cart, housework, or gardening would not be considered exercise in this study. When answering the questions, do not use these activities to mean exercise.**

PLEASE READ THE FOLLOWING STATEMENTS AND EITHER CIRCLE YES OR NO FOR EACH ITEM

1. **I currently exercise** YES NO
2. **I intend to exercise in the next 6 months** YES NO
3. **I currently exercise regularly*** YES NO
4. **I have exercised regularly* for the past 6 months** YES NO
5. **I have exercised regularly* in the past for a period of at least 3 months** YES NO

IF YOU DO NOT EXERCISE AT ALL, PLEASE SKIP TO QUESTION #7

6. **If you CURRENTLY exercise at any level, please answer A through D.**

   A. **How many days per week do you exercise?** _____

B. What kind of exercise do you do?

_____

C. Approximately how many minutes do you exercise each time? _____

D. How long have you been exercising at this level? _____months _____years

IF YOU CURRENTLY EXERCISE AND ANSWERED QUESTION #6, SKIP QUESTION #7, AND GO TO QUESTION #8

7. How long has it been since you have done regular exercise*?
   A. Less than 1 month
   B. 1-3 months
   C. 4-6 months
   D. 7-11 months
   E. 1-2 years
   F. 3-5 years
   G. More than 5 years
   H. I have never exercised regularly*

8. If you are not regularly exercising, what is preventing you from doing so now?

_____

_____

9. Have you tried to exercise in the past? YES NO

If yes, why did you stop exercising?

_____

_____

How many times have you tried to start an exercise program? _____

EXERCISE PROCESS OF CHANGE QUESTIONNAIRE

The following experiences can affect the exercise habits of some people. Think of similar experiences you may be currently having or have had during the past month. Then rate how frequently the event occurs. Please circle the number that best describes your answer to each experience. HOW FREQUENTLY DOES THIS OCCUR?

	NEVER		OCCASIONALLY		REPEATEDLY
15. Instead of remaining inactive, I engage in some physical activity.	1	2	3	4	5
16. I tell myself I am able to keep exercising if I want to.	1	2	3	4	5
17. I put things around the house to remind me of exercising.	1	2	3	4	5
18. I tell myself that if I try hard enough I can keep exercising.	1	2	3	4	5
19. I recall information people have personally given me on the benefits of exercise.	1	2	3	4	5
20. I make commitments to exercise.	1	2	3	4	5
21. I reward myself when I exercise.	1	2	3	4	5
22. I keep things around my place of work that remind me to exercise.	1	2	3	4	5
23. I think about information from articles and advertisements on how to make exercise a regular part of my life.	1	2	3	4	5
24. I find society changing in ways that make it easier for the exerciser.	1	2	3	4	5
25. Warnings about health hazards of inactivity affect me emotionally.	1	2	3	4	5
26. Dramatic portrayals of the evils of inactivity affect me emotionally.	1	2	3	4	5
27. I react emotionally to warnings about an inactive lifestyle.	1	2	3	4	5
28. I worry that inactivity can be harmful to my body.	1	2	3	4	5
29. I am considering the idea that regular exercise* would make me a healthier, happier person to be around.	1	2	3	4	5
30. I have someone on whom I can depend when I am having problems with exercising.	1	2	3	4	5
31. I read articles about exercise in an attempt to learn more about it.	1	2	3	4	5

	NEVER		OCCASIONALY		REPEATEDLY
32. I try to set realistic exercise goals for myself rather than setting myself up for failure by expecting too much.	1	2	3	4	5
33. I have a healthy friend that encourages me to exercise when I don't feel up to it.	1	2	3	4	5
34. When I exercise, I tell myself that I am being good to myself by taking care of my body.	1	2	3	4	5
35. Exercise is my special time to relax and recover from the day's worries, not a task to get out of the way.	1	2	3	4	5
36. I am aware of more and more people encouraging me to exercise these days.	1	2	3	4	5
37. I do something nice for myself for making efforts to exercise more.	1	2	3	4	5
38. I have someone who points out my rationalizations for not exercising.	1	2	3	4	5
39. I have someone who provides feedback about my exercising.	1	2	3	4	5
40. I remove things that contribute to my inactivity.	1	2	3	4	5
41. I am the only one responsible for my health and only I can decide whether or not I will exercise.	1	2	3	4	5
42. I look for information related to exercise.	1	2	3	4	5
43. I avoid spending long periods of time in environments that promote inactivity.	1	2	3	4	5
44. I feel I would be a better role model for others if I exercise regularly.	1	2	3	4	5
45. I think about the type of person I will be if I keep exercising.	1	2	3	4	5
46. I get frustrated with myself when I don't exercise.	1	2	3	4	5
47. I notice that more businesses are encouraging their employees to exercise by offering fitness courses and time off to work out.	1	2	3	4	5
48. I wonder how my inactivity affects those people who are close to me.	1	2	3	4	5
49. I realize that I might be able to influence others to be healthier if I would exercise more.	1	2	3	4	5

4. What diabetes complications do you have? (Circle all that apply)
   A. Eye disease - Retinopathy
   B. Kidney disease - Nephropathy
   C. Nerve damage to the feet and legs - Peripheral Neuropathy
   D. Nerve damage involving the stomach, intestines, heart, impotence - Autonomic Neuropathy
   E. High Blood Pressure
   F. Other (Identify) _____

5. How would you classify your level of diabetes control?
   A. Very good control
   B. Good control
   C. Fair control
   D. Poor control
   E. Not controlled

6. What was your last glycosylated hemoglobin (HgA1C)?_____(if known)

For the following questions about yourself, fill in the blank or circle the answer

7. What year were you born? _____

8. What is your gender? Male Female

9. What is your race/ethnic background?

Mexican American	African American	Other (Identify)_____
American Indian	Asian American	
White	Latin American	

	NEVER		OCCASIONALLY		REPEATEDLY
50. I am aware that many health clubs now provide free baby-sitting services to their members.	1	2	3	4	5
51. Some of my close friends might exercise more if I would.	1	2	3	4	5
52. I consider the fact that I would feel more confident in myself if I exercise regularly*.	1	2	3	4	5
53. When I feel tired, I make myself exercise anyway because I know I will feel better afterward.	1	2	3	4	5
54. When I am feeling tense, I find exercise a great way to relieve my worries.	1	2	3	4	5

EXERCISE SELF-EFFICACY QUESTIONNAIRE

Please indicate on the scale how confident you feel in the following situations.

I am confident I can participate in regular exercise when:	Does not apply	Not at all confident				Confident					Very confident
I am tired.	0	1	2	3	4	5	6	7	8	9	10
I am in a bad mood.	0	1	2	3	4	5	6	7	8	9	10
I feel I don't have the time.	0	1	2	3	4	5	6	7	8	9	10
I am on vacation.	0	1	2	3	4	5	6	7	8	9	10
It is raining or snowing.	0	1	2	3	4	5	6	7	8	9	10

EXERCISE DEMOGRAPHICS QUESTIONNAIRE

Please answer the following questions about your diabetes.

1. **Age when diagnosed** _____

2. **Current Height** _____ **Current Weight** _____

3. **Current form of diabetes therapy (circle all that apply)**

   A. **Diet**
      1. **What meal plan do you usually follow?**
         a. **ADA** _____**Kcal**
         b. **Healthy Heart**
         c. **Pyramid**
         d. **Carbohydrate Count** _____**grams/day**
         e. **No specific meal plan**
      2. **What percentage of the time do you follow your meal plan?**
         a. **0%**
         b. **1-25%**
         c. **26-50%**
         d. **51-75%**
         e. **76-100%**

   B. **Pills (please specify)** _____
   C. **Insulin (specify doses and timing)**_____
   D. **Other**_____

4. What diabetes complications do you have? (Circle all that apply)
   A. Eye disease - Retinopathy
   B. Kidney disease - Nephropathy
   C. Nerve damage to the feet and legs - Peripheral Neuropathy
   D. Nerve damage involving the stomach, intestines, heart, impotence - Autonomic Neuropathy
   E. High Blood Pressure
   F. Other (Identify) _____

5. How would you classify your level of diabetes control?
   A. Very good control
   B. Good control
   C. Fair control
   D. Poor control
   E. Not controlled

6. What was your last glycosylated hemoglobin (HgA1C)?_____(if known)

For the following questions about yourself, fill in the blank or circle the answer

7. What year were you born? _____

8. What is your gender? Male Female

9. What is your race/ethnic background?

Mexican American	African American	Other (Identify)_____
American Indian	Asian American	
White	Latin American	

10. What is your current employment status? (Circle all that apply)

Full-time	Part-time
Retired	Unemployed
Student	Homemaker
Other_____	

11. What kind of work do you do?

_____

_____

12. Have you ever received any information regarding the benefits of exercise in diabetes control? (For example, handouts, watched a video, instruction by your physician or nurse?)

YES NO DO NOT REMEMBER

13. If yes to question #10, from whom did you receive this information? (Circle all that apply)

Nurse	Dietitian	Other (Identify)_____
Diabetes Nurse	Diabetes Support Group	
Physician	Diabetes Meeting	
Diabetes Handouts	Diabetes Forecast (magazine)	

APPENDIX B

Exercise Stage of Change
Algorithm

Items:

1. I currently exercise.

2. I intend to exercise in the next 6 months.

3. I currently exercise regularly.

4. I have exercised regularly for the past 6 months.

5. I have exercised regularly in the past for a period of at least 3 months.

Scale:

1 = Yes: 0 = No

Scoring:

If (item 1 = 0 and Item 2 = 0) then Stage = Precontemplation
If (Item 1 = 0 and Item 2 = 1) then Stage = Contemplation
If (Item 1 = 1 and Item 3 = 0) then Stage = Preparation
If (Item 1 = 1 and Item 3 = 1 and Item 4 = 0) then Stage = Action
If (Item 1 = 1 and Item 3 = 1 and Item 4 =1) then Stage = Maintenance

APPENDIX C

Exercise Processes of Change
Algorithm

For each process. take the mean of the individual items as noted.

PROCESS	**ITEMS**	**COMPUTE**
Consciousness Raising	19,23,31,42	Compute CR = ((item 19 + item 23 + item 31+ item 42)/4)
Self Liberation	16,18,20,41	Compute SL = ((item 16 + item 18 + item 20 + item 27)/4)
Dramatic Relief	25,26,27,28	Compute DR = ((item 25 + item 26 + item 27 + item 28)/4)
Environmental Reevaluation	44,48,49,51	Compute ER = ((item 44 + item 48 + item 49 + item 51)/4)
Helping Relationships	30,33,38,39	Compute HR = ((item 30 + item 33 + item 38 + item 39)/4)
Stimulus Control	17,22,40,43	Compute SC = ((item 17 + item 22 + item 40 + item 43)/4)
Counter Conditioning	15,35,53,54	Compute CC = ((item 15 + item 35 + item 53 + item 54)/4)
Social Liberation	24,36,47,50	Compute SOL = ((item 24 + item 36 + item 47 + item 50)/4)
Self Reevaluation	29,45,46,52	Compute SR = ((item 29 + item 45 + item 46 + item 52)/4)
Reinforcement Management	21,32,34,37	Compute RM = ((item 21 + item 32 + item 34 + item 37)/4)

APPENDIX D

Exercise Self-Efficacy
Algorithm

Items:

I am confident I can participate in regular exercise when:

1. I am tired.
2. I am in a bad mood.
3. I feel I don't have time.
4. I am on vacation.
5. It is raining or snowing.

Scale:

0 = Does not apply
1 = Not at all confident
10 = Very confident

Scoring:

Compute T-Score for each of the five items.

Calculate mean on the T score for five items.

ACT Physical Activity Recall

ID ☐☐☐☐☐☐ Acrostic ☐☐☐☐☐☐

Date Completed ☐☐☐☐☐☐ (Mon Day Year) Visit Code ☐☐☐

Day of the week form completed : _____

1. Were you employed in the last seven days? 1☐ Yes 2☐ No

2. How many days of the last seven did you work? ☐ (round to nearest day)

3. How many total hours did you work in the last seven days? ☐☐ hours

4. What days of the week do you consider to be your weekend or non-work days? For most people this would be Saturday and Sunday but it may be different for you.

   1☐ Sunday 2☐ Monday 3☐ Tuesday 4☐ Wedr.esday 5☐ Thursday 6☐ Friday 7☐ Saturday

5. If you did not work your usual week, why did you work less than usual?

   _____

   _____

6. For the past seven days, and thinking only about activities that are ***at least*** of moderate intensity, how many days did you do activity or exercise that added up to at least 30 minutes each day?

   ☐ number of days (0 to 7)

Acrostic ☐☐☐☐☐☐

	Days of the Week	Yesterday HRS MIN		One Week Ago HRS MIN				
	Sleep	:	:	:	:	:	:	:
MORNING	Moderate	:	:	:	:	:	:	:
	Hard	:	:	:	:	:	:	:
	Very Hard	:	:	:	:	:	:	:
AFTER NOON	Moderate	:	:	:	:	:	:	:
	Hard	:	:	:	:	:	:	:
	Very Hard	:	:	:	:	:	:	:
EVENING	Moderate	:	:	:	:	:	:	:
	Hard	:	:	:	:	:	:	:
	Very Hard	:	:	:	:	:	:	:

Calculated Energy Expenditure ☐☐.☐ Kcal/kg/day

Acrostic ☐☐☐☐☐☐

7 Was this a typical week in terms of your usual pattern of activity or exercise?

1☐ Yes

2☐ No — Were you more or less active in the past week than you usually are? 1☐ More 2☐ Less

Until now, we've just been talking about the last seven days. Now I would like you to think about your usual activities over the last three months.

8. During your work week, on average how many hours per day do you spend sitting quietly (e.g., watching TV, working at a desk or computer, eating, or reading)? ☐☐ average hours per day

During your weekend, on average how many hours per day do you spend sitting quietly. (e.g., watching TV, working at a desk or computer, eating, or reading)? ☐☐ average hours per day

9 How many flights of stairs do you climb up each day? (1 flight = 10 steps) ☐☐ number of flights

10. If you had to add together the total minutes you spend walking during the day, how many minutes would that be? Remember, add up your actual walking time and don't add in the time spent just standing Include your to and from walking and any fitness walking. Don't try to remember every step, just give a general idea of the time spent walking. ☐☐☐ total minutes per day.

11. What is your usual pace of walking? Mark **ONE** only.

1☐ Casual or strolling (less than 2 miles per hour)
2☐ Average or normal (2 to 3 miles per hour)
3☐ Fairly brisk (3 to 4 miles per hour)
4☐ Brisk or striding (4 miles per hour or faster)

12. Do you regularly do strength and flexibility exercises like sit-ups, push-ups, yoga, or stretching?

1☐ Yes — How many days per week do you do these exercises? ☐ number of days (0-7)
2☐ No

13. On the days that you do strength and flexibility exercises, how many minutes do you spend doing them? ☐☐☐ total minutes

Form completed by ☐☐ (staff code)

Appendix F

Activity Counseling Trial

Physical Activity Assessment Procedures

Manual of Operations

Pre-screening procedures

7-day Physical Activity Recall procedures

Appendix F

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Appendix F

Acknowledgments

This manual has been produced for use in the Activity Counseling Trial (ACT). It has been adapted from work done at San Diego State University (Project Grad, James Sallis, Ph.D Principal Investigator) and the Cooper Institute for Aerobics Research (Project Active, Steven N. Blair, P.E.D., Principal Investigator). Revisions for the current version of the manual have been led by Laura E. Becker and Harold W. Kohl, Ph.D. (Cooper Institute).

Appendix F

Physical Activity Pre-screening Items

I. INTRODUCTION

An initial eligibility criterion for inclusion in the Activity Counseling Trial (ACT) is a weekly energy expenditure of not more than 35 kcal • kg^{-1} • $week^{-1}$. These values will ultimately be determined by responses evaluated using an interview-administered 7-day Physical Activity Recall (PAR) questionnaire. In order to pre-screen individuals who may exceed these energy expenditure levels, questionnaires will be administered to potential study participants at the initial telephone interview and the prescreening orientation visit (SV0).

II. TELEPHONE INTERVIEW

As part of the initial telephone interview for recruitment eligibility, the following question will be asked of all potential study participants.

1. "Do you currently and regularly participate in any physical activity such as walking, running, aerobic dance, swimming, or playing sports at least three times per week for 30 minutes or longer each time?"
2. "If you have a job, does your job require you to do heavy manual labor for most of your shift?"

If the answer to either question is affirmative, potential participants should be ruled ineligible.

III. PRE-SCREENING VISIT

At the time of the initial pre-screening visit (SV0) all potential participants who satisfied the criteria for the telephone interview will be asked to answer a series of simple questions on physical activity. The purpose of these questions is to further restrict potential study participants to only those who are sedentary. The responses to these questions comprising the 7 day physical activity recall and

the resulting energy expenditure calculation will be used to identify participants who may be ineligible due to excessive energy expenditure.

Appendix F

7-Day Physical Activity Recall Interview

I. INTRODUCTION

The 7-Day Physical Activity Recall (PAR) interview technique is used to estimate an individual's average daily energy expenditure for the previous week. Based upon participant recalls, hours spent in ***moderate, hard***, and ***very hard*** intensity activities are determined and total kilocalories can be estimated from the number of hours engaged at the various levels of intensity. The purpose, therefore, is not to single out specific physical activities but to identify participation in activities at various levels of intensity. With this interview technique, we will be looking at work-related activities, leisure-time activities, sitting patterns, and sleep patterns. By mathematical difference, these data will then be used to estimate activities classified as ***light*** intensity. The purpose of this manual is to standardize the interview process and to increase agreement among interviewers.

Your interview technique should limit bias (it should be objective), and you should try to keep the interview from becoming tedious. To achieve these goals, an interviewer script has been created and is included in the Appendix of this manual. Although the interviewer does not have to memorize this script it should be followed very closely to reduce variability between and within interviewers. A major effort should be made by the person conducting the interview not to be judgmental of participant responses. There are no right or wrong answers to the interview. It is important to set a positive, non-threatening tone and to put the participant at ease at the beginning of the interview. It is also important to remember not to let the study participant sidetrack you. It may be difficult for participants to remember their past week's activity. Some may not try very hard, and others get bogged down in details. You should strive to achieve a happy medium. You should control the pace of the interview; extraneous talk should be avoided. If participants are going into excessive detail, you should remind them that they need not account for every minute but that an average or estimate is expected. For example, you might ask, "How much time in general?" or "about how long?".

It is important to remember that most of the participants you see will spend a vast majority of their waking hours doing ***light*** activity. Many tiring and unpleasant household or occupational tasks do not have a very high energy cost. Clerks in a store, for example, may be on their feet all

day and may feel fatigued, but the energy cost is in the ***light*** category. An exception to this example would be time spent in stocking shelves, which probably would be classified as ***moderate*** activity. Also, for most occupational tasks that require at least moderate energy expenditure, it is important to accurately determine the actual time spent doing the activity. In the stocking clerk example, even though a person might do that activity for an entire shift, it probably would not equal eight hours. You should try to subtract time spent on lunch, breaks, and the like.

II. INTERVIEWER PREPARATION GUIDELINES

A. THE FOLLOWING POINTS SHOULD BE EXPLAINED TO EACH PARTICIPANT BEFORE ACTUALLY BEGINNING THE PHYSICAL ACTIVITY INTERVIEW. REVIEWING THE INTERVIEWER SCRIPT PROVIDED IN THE APPENDIX WILL ASSIST IN COMMUNICATING THIS INFORMATION:

1. They are to think of their physical activities during the past seven days. It is important to stress that this is a recall of actual activities for the past week, not a history of what they usually do.
2. ***Light*** activities, such as desk work, standing, light housework, softball, archery, bowling, and the like (where there is little movement of large muscles) will be considered in a separate part of the physical activity interview. For the 7-day recall, we are interested in occupational, household, and sports activities that make you feel relative to how you feel when you are walking or make you feel like you are working as hard as when you are walking briskly (15-20 minutes per mile).
3. Explain to the participant that he or she will be asked to categorize the intensity of the activity into one of three groups, ***moderate, hard*** or ***very hard***. Explain that the ***moderate*** category is similar to how one might feel while walking at a 15-20 minute per mile pace and that the ***very hard*** category is similar to how one might feel when running. The ***hard*** category falls in between. In other words, if the activity in question seems harder

than walking but not as strenuous as running, place it in the ***hard*** category. Here (prior to the interview) it is a good idea to give examples and interact with the participant enough to allow feedback for a complete understanding of the types and intensities of activities that would fall into these categories. Laminated cards highlighting examples of each of the intensity categories are provided to each interviewer. Prior to conducting the interview, the interviewer should be familiar with the energy cost of many common activities (see Certification and Quality Control section later in this chapter). Study personnel are urged to consult the reprint of Ainsworth et al. (Compendium of Physical Activities, found in Appendix) for a listing of these energy costs.

4. Should any questions arise regarding administration of the PAR during the course of ACT, study personnel are requested to contact the Dallas Center (Laura Becker, 214-701-8001) for clarification and direction. All issues raised during the study will be recorded in a logging book for future reference.

III. INTERVIEW PROTOCOL AND GUIDELINES

Physical activity recall data for ACT will be collected on pre-printed forms and transferred to computerized form. Detailed information on participant interviewing can be found in the interviewer script (Appendix). Detailed information on completion of the pre-printed forms is found below.

A. Page 1 - Work Schedule and Physical Activity Accumulation Questions

1. Start the interview by asking the participant the employment question(s) on the 7-day PAR Questionnaire.
   a. "Were you employed in the last seven days (including paid work and volunteering)?"
      1. Yes
      2. No (Skip immediately to Question 6, page 1)

b. "How many days of the last seven did you work outside the home?"
   1. Number of days
c. "How many total hours did you work in the last seven days?"
   1. Hours last week
d. "What days of the week do you consider to be your weekend or non-work days?"
e. If the participant reports fewer than 7 days (reported weekdays + weekend days), "Why did you work fewer days this past week than usual?" If the participant's work days and weekend days total more than 7, note the reason for the increased work time.
f. "For the past seven days, and thinking only about activities that are at least of moderate intensity (show laminated cards), how many days did you do activity or exercise that added up to at least 30 minutes each day?"
g. Go to PAR Worksheet

B. Establishing the Days of the Week for the 7-day Recall and Use of Worksheet

1. **To aid the participant in recall you will ask about each day in turn starting with yesterday and working backwards.** "Okay, today is Tuesday, yesterday was Monday." Also make sure to **label the worksheet (see below) with the appropriate days of the week.** Do this by placing yesterday's day of the week in the blank below the column labeled "Yesterday." Then, working backwards with respect to day of the week, write each of the past 6 days of the week in the appropriate space above the columns, ending with the last day of the recall week below the column labeled "One Week Ago." This makes logging the participant's activities much easier. Also, connecting activities to specific days of the week helps the participant to remember more.
2. The PAR worksheet (a Xerox copy of page 2 of the PAR form) is used to help the interviewer summarize the physical activity recall reported by the

study participant. Minutes that the participant reports having spent in moderate, hard, and very hard activities (as well as sleep time) are recorded on the Worksheet. These data will then be transferred to the PAR form and used to calculate an estimate of energy expenditure to determine study eligibility (see Recruitment and Eligibility chapter of MOP) and as a primary outcome variable. Several key points about use of the Worksheet are listed below.

a. Make sure to **label the worksheet with the appropriate days of the week.** This makes logging the participant's activities much easier.
b. **Record time of sleep** in spaces provided on worksheet. Time segments should be recorded in 15 minute (:15), 30 minute (:30), 45 minute (:45), or hour (:00) time blocks. *Rounding to the nearest 15 minutes applies to sleep times only.*
c. **Record activity and time of activity** in spaces provided on worksheet for morning, afternoon, and evening at the various levels of intensity. For activity that is continuously performed, it must have been performed at least 10 minutes to be recorded. Round times spent in activities to the nearest minute. For example, jogging three miles in 27 minutes and 52 seconds would be recorded as follows:

Very Hard	3 mi. jog
	:28

Likewise, walking five miles in 1 hour, 15 minutes and 20 seconds would be recorded as follows:

Moderate	5 mi. walk
	1:15

d. Draw a light, wavy line down the column of the individual's weekend day(s). Remember they may not necessarily be Saturday and Sunday.

C. Sleep

1. The first item on the PAR Worksheet is an assessment of the participant's **sleep** times for the week. The goal in estimating the sleep pattern in the PAR is to get an estimate of an individual's hours spent in bed per night. Even if they claim not to have slept, if they were in a prone position, they used approximately the same number of kilocalories as sleep. The number would be rounded to the nearest 1/4 hour. For example, if the individual reported 20 minutes, round down to 15 minutes (:15). If they report 25 or 35 minutes this would be rounded to 30 minutes (:30), if they have 40 or 50 minutes, round to 45 minutes (:45), and if they report between 55 and 05, round to the nearest hour (:00). Many people will get in bed and get out of bed at consistent hours on the weekdays. This should be determined as an initial step by asking the following:

a. For the past 5 weeknights, did you usually get in bed and get out of bed at the same time, or did it vary each night?

1. If the times vary most nights, go day by day beginning with getting in bed last night and getting out of bed this morning (the day of the interview). Work your way back through the week asking for the specific times they got in bed and got out of bed each night and day. Going backwards helps people remember by starting with the most recent time frame.

2. If the times of getting in bed and getting out of bed are fairly constant during the weekdays, ask what time they got in bed and what time they got out of bed and record these numbers on the worksheet. Ask the participant if there were any unusual weekdays when they might have gotten in bed or out of bed earlier or later.

Record any of these changes on the appropriate day. Next, ask the participant about the past Saturday night getting up on Sunday and the last Friday night (or equivalent weekend days) getting up on Saturday. Record these numbers on the worksheet.

For example, if the interview takes place on a Tuesday, the first night of recorded sleep (working backwards from Tuesday) would be going to sleep Monday night and getting up on Tuesday morning the day of the interview). The total number of hours slept in this time frame would be recorded for Monday night (labeled "yesterday" on the Worksheet). The next night of sleep assessed would be Sunday night, getting up on Monday. This number would be entered into the Sunday column. Therefore, keep in mind that although the labeled column refers to that *day's* activities, it also refers to that *night's* sleep times.

b. Keep in mind that some people may nap during the day or fall asleep while reclined in a chair. This time should be added to the pertinent night's sleep time. To capture this information the participant should be asked if they took any naps or laid down for any period during the last seven days. Interviewers should be particularly alert to this if there was a night of limited or no sleep time.

D. Overview Of The Interview

1. Starting with yesterday and working backward, ask about activities during each day.
2. Ask only about activities that are ***moderate***, (at least the intensity of brisk walking), ***hard*** (intensity between walking and running), and ***very hard*** (intensity of running).

3. Ask about activity during each segment of each day as a separate question. For example, "On Wednesday morning, from the time you got out of the bed until the time you had lunch, did you do anything you would consider moderate, hard, or very hard?" Morning is generally considered from the time they wake up in the morning to the time they have lunch, afternoon is from lunch to dinner and evening is from dinner until the time one goes to bed. The previous question would then be repeated for the remaining segments of the day.
4. It will help recall significantly to have the participant remember what he or she did during the day in question. If the participant is having trouble remembering their activities during each segment of the day, as the general question, "Do you remember what you did on (Tuesday)?" Once the participant starts remembering, switch back to the segments of the day as outlined above (i.e., morning, afternoon, evening).
5. The interview needs to be sensitive to walking. However, people walk many times during the day, and we will not count all of them. For example, we do not want them to add up each time they walk to the refrigerator. **The general rule is that they should do 10 minutes in a given intensity category in a given segment of the day (e.g., morning, afternoon, evening).** The specific rule for walking is that you only count walking that is continuous for at least 10 minutes or intermittent walking performed during a limited period of time (such as 1-2 hours) which would total 10 minutes or more. An example of intermittent walking that would qualify would be briskly walking through a shopping mall for 60 minutes with the walking time interspersed with stopping to window shop. If the total accumulation of walking was 45 minutes (of the 60) and 15 minutes was spent window shopping, the time to be recorded would be 45 minutes. This would be classified as ***moderate*** unless the participant walked very fast or race-walked.

6. Make sure to emphasize the intensity guidelines. For example, the participant should be asked, "When you are doing the activity, is it similar to how you feel when you are walking at a 15-20 minute per mile pace, or is it similar to how you feel when you are running, or is it somewhere in between?" If the activity is of an intensity less than a brisk walk, it is considered a ***light*** activity and is not included in the worksheet.

E. Activity

1. Frequency:
   a. Probe to determine if the amount of the activity the participant reports is per weekend, per week, or per day, etc. Someone may say, for example, "I did one hour of digging this past weekend " when what they meant is, "I did one hour of digging each of the two days this past weekend."
   b. Some people have trouble recalling or pinpointing the ***moderate*** to ***very hard*** activities they have engaged in over the past seven days. In such cases, **try to cue them** by asking them general questions. For example, "How about any housework that made you feel similar to brisk walking?", "Did you take any walks?", How do you get to and from work?", "Did you participate in any sports?", "Any vigorous family activities?", "Did you do any vigorous home repair or gardening?".
   c. Take a retrospective look back at each day by asking the respondent whether there is any activity they may have forgotten to mention.
2. Intensity:
   a. If you are unsure of the strenuousness of an activity that they may have participated in, **ask them to describe the physical effort involved.** For example, what does the activity entail? We have found that walking and running provide good frames of reference for classifying activities. Everyone should be familiar with the relative intensity of ***brisk*** walking, which is about the midpoint of the moderate activity

category. Therefore, if some other activity that the participant reports seems to be about as strenuous to the individual as **walking briskly,** then the activity should be coded as ***moderate.*** Most running or jogging at any speed falls into the ***very hard*** category. If some activity seems about as strenuous to the individual as running, classify the activity as ***very hard.*** If the activity in question seems harder than walking but not as strenuous as running, place it in the ***hard*** category.

b. For most activities, the rate at which they are performed can make a huge difference in the energy cost. It is possible to play single tennis, for example, so as not to move around much and not expend much energy. **Try to get some indication of how hard they are working at a particular task.** Again, use comparisons to walking and running so they can rate how hard they did the activity.

3. Time:

a. Some people have trouble quantifying the amount of time they spent doing ***moderate***, ***hard***, or ***very hard*** activities. In such cases, **break down all of their activities into specific events and ask them how long they did each activity.** Then sum up the amount of time relevant to each category. If the individual is having difficulty quantifying the amount of time engaged in a particular activity, suggest to the individual possible time frames such as 15 minutes, 30 minutes, 45 minutes, or an hour. However, it is not necessary to round participant answers to anything but the nearest minute.

b. **The activity in question should be performed for a total of 10 minutes, intermittently or continuously, during one segment of the day; morning, afternoon, or evening.** For example, if their activities add up to at least 10 minutes in one intensity category (e.g., ***hard***) for one segment of the day (e.g., Wednesday afternoon), the total time of those activities should be counted. If 10 minutes of activity is spread out over two or more segments of the day, it is not counted. Th

purpose of this rule is to eliminate the need to recall and record each minute of activity.

c. **Be sure that the time reported for an activity was actually spent doing the activity.** Being at the pool for 2 hours but only swimming for 15 minutes, for example, should be recorded as 15 minutes, not 2 hours. Working in the garden all day Saturday (8 hours) should mean actually working for 8 hours. **Do not record the time spent on breaks, rest periods, meals, and the like.**

4. Special Cases:

a. **If the last week was totally atypical**--for example, in the hospital or in bed, or involving a family crisis, or a work crisis, or travel--**it is permissible to go to the previous week for the survey.** Do not take this action lightly: use it only in unusual circumstances.

b. If a person has weekdays instead of weekends off from work--for example, Tuesday and Wednesday instead of Saturday and Sunday--ask the participant if they consider the weekdays they have off as their weekend. If they do not consider the days off as their weekend days, ask them which days are most like weekends. Some participants may only consider one day as their weekend day. Others may have three day weekends. The point here is to determine the participant's non-work days as they are likely to have a different routine than the workdays. **Make sure to count the most appropriate days of the week, as indicated by the participant, as weekend days.**

c. Weekend days should be denoted on the worksheet by drawing a light, wavy line through the activities for the days which the participant counts as weekend days.

F. Strength and Flexibility Exercises

Any reported strength and flexibility exercises performed for at least 10 minutes should be recorded on the worksheet if they are performed at the

moderate, hard, or very hard intensity level as are any other physical activities. Usually strength and flexibility exercises will be recorded as ***moderate*** physical activities, however the interviewer should be confident that these activities are performed at the same intensity as going on a brisk walk. The classification can be verified by determining the time spent in the activity and the total number of exercises (i.e., number of sit-ups, push-ups, etc.) performed during that time period.

G. Review

1. At the end of each day of recall, the interviewer should ask the participant to take a **retrospective look of the past week** as well as at the end of **each day** to determine any activities that may have been overlooked.
2. **Use cues as much as possible** to aid in the participant's recall of the past week. For example, "Did you want to add any other household, occupational, or sports activities that you participated in the past week and that we have not talked about?" "Did you take any walks we have not already covered?", "Are there any activities that you are unsure about?". However, it is important that the interviewer administer these questions consistently to all participants.

H. Other Physical Activity Questions.

1. Was this a typical week in terms of your usual pattern of activity or exercise? (YES/NO).
   a. If NO, were you more or less active in the past week than you usually are? (MORE/LESS).
2. Sitting Activities

   Sitting activities are not recorded as part of the PAR worksheet, but are of interest to ACT nonetheless. Therefore, two questions on such activities are included on page three of the Physical Activity Recall form. Such activities include sitting, watching television, working at a

desk or computer, eating or reading, etc. We are interested in the participant's usual activity over the last three months.

a. Review the time period transition and the list of sitting activities with the participant and ask them to give an average of the hours spent sitting during their work week. Some participants will be able to do this quickly as their days usually follow a routine. Remember, we are looking for a **global** estimate of sitting time over the last three months, therefore, it is not appropriate to attempt to match this answer with the previous week's recall..

b. Repeat for average weekend or non-work time spent sitting for whichever days the participant considers to be weekend days.

2. Ask about the number of flights of stairs climbed up each day and record answer. Note that 10 steps equals a flight and that we are only interested in flights climbed, not flights up and down.
3. Participant should provide an estimate of the number of minutes walked during a day and the pace at which they walk. The participant does not need to count each step, rather a general estimate of the time they spend walking during a typical day.
4. Ask the participant the three questions regarding strength and flexibility exercises. Remember the time frame for these activities is over the last three months.
5. Thank the participant for their time and participation. The interview is concluded.

I. Summarizing The Worksheet

1. After the interview, data from the completed worksheet is entered into the ACT 7-day Energy Expenditure Calculation Software. The computer program calculates summaries of the intensity categories necessary to give a kilocalorie per day estimate of physical activity for each participant. Before entry into the computer, the interviewer must summarize the daily hours of

sleep. The daily hours of sleep for the last seven days will be entered into the energy expenditure calculation computer program.

2. Prior to data entry the interviewer should visually review each form and ensure completeness and correctness of each entry. Questionable intensities of reported physical activities should be verified using the Compendium of Physical Activities or with Laura Becker at the Dallas Clinic.
3. Prior to data entry, each interviewer should be thoroughly familiar with procedures and protocols for use of the ACT 7-day Energy Expenditure Calculation Software.

J. Manual Calculation of the 7 Day Recall Form

Calculation of the kilocalorie expenditure for the 7 Day Recall Form should be performed using the ACT PAR Scoring Application software installed at each clinical site. If the data collection site is different from the location of the ACT data entry computer with the scoring software installed, computer calculation is still possible via faxing and telephone relay between the two sites. In cases of power failure or computer failure, the following manual calculation may be used to score the ACT Physical Activity Recall form. However, due to the increased likelihood of mathematical error the manual calculation should be used only when all other options fail. As soon as possible, PAR forms that have been hand calculated should be entered into the ACT PAR Scoring Application software to confirm the PAR score.

Appendix F

The following example refers to the responses for the 7 Day Recall Certification audio tape which was administered at each site. Very hard intensity activity has been added that was not part of the audio tape.

1. Sum the seven nights of sleep. Example:

6:00
5:30
7:15
5:30
9:45
7:00
5:30
46:30 = total hours of sleep

2. Sum the daily hours/minutes spent in moderate intensity activity for each line of the recall. Example:

Thurs. morning		:17	
Wed. morning	:17		
Tues. morning	:17		17 x 3 = 51 minutes
Sun. morning	:20		+ 20 minutes = 1 hour, 11 minutes
Sat. morning	:16		+ 16 minutes = 1 hour, 27 minutes
Fri. morning	:15		+ 15 minutes = 1 hour, 42 minutes
Thurs. afternoon		:15	
Mon. afternoon		1:15	afternoon totals = 1 hour, 30 minutes

Total moderate intensity activity = 3 hours, 12 minutes

3. Sum the daily hours/minutes spent in hard intensity activity for each line of the recall. Example:

Thurs. afternoon	:45
Wed. afternoon	:30
Fri. afternoon	:36

Total hard intensity activity = 1 hour, 51 minutes

4. Sum the daily hours/minutes spent in very hard intensity activity for each line of the recall. In this example there was no very hard intensity activity.

Tues. evening :42

Total very hard intensity activity = 0:42

5. Sum the totals for sleep, moderate, hard, and very hard. Example:

46:30
3:12
1:51
1:42
53:15 = total hours of sleep, moderate, hard, and very hard.

6. Subtract total obtained in step 5 from 168 to get time spent in light activity. Example:

168:00
- 53:15
114:45 = total hours of light activity.

7. Divide the minutes portion of each of the categories by 60 to obtain the fraction of each hour spent in activity. Example:

Sleep = 46:30 (30/60 = .5), total sleep = 46.5
Light = 114:45 (45/60 = .75), total light = 114.75
Moderate = 3:12 (12/60 = .20), total moderate = 3.20
Hard = 1:51 (51/60 = .85), total hard = 1.85
Very Hard = :42 (42/60 = .70), total very hard = .70

8. Use the following table to perform the next calculation:

Activity	Total Time	Multiply by:	Total
Sleep	46.5	1	46.5
Light	114.75	1.5	172.125
Moderate	3.20	4.0	12.8
Hard	1.85	6.0	11.1
Very Hard	1.70	10.0	17.0
	168.00	Grand Total	259.525

9. Divide grand total by 7 to obtain energy expenditure to determine eligibility. Example:

259.525/7 = 37.075

Because the energy expenditure is greater than 35 kcal/kg/wt, this person is ineligible.

K. Evaluation Of The Interview By The Interviewer

In some cases it may be important for the interviewer to give a subjective evaluation of the quality of the interview once it has been completed. Please attach the PAR Interview Evaluation Form to the Worksheet once completed. Although these data will not be entered into the computer, the subjective opinion of the interviewer is important to evaluate data quality.

1. Were there any problems with this survey?
   a. Yes
   b. No
   c. Explain
2. Do you think this was a valid interview?
   a. Yes
   b. Maybe
   c. No
3. Please list any activities reported by the participant which you **don't** know how to classify.

   Procedures for dealing with data from interviews determined to be invalid will be handled on a case-by-case basis. Interviewers are requested to discuss such cases with Laura Becker at the Dallas Clinic.

L. Important Procedures The Interviewer Often Overlooks

1. Ask about each day in turn starting with yesterday and working backwards. "Okay, today is Tuesday, yesterday was Monday." Also make sure to label the worksheet with the appropriate days of the week. This makes logging the participant's activities much easier. Also connecting activities to specific days of the week aids the participant in recall of events.
2. Before asking about activities, it might help to ask the participant what he or she did that day, in general. "Where did you go and what did you do on that day?" Again, this helps them recall activities specific to that day.

3. Ask separately about each segment of the day. "What activities did you do in the morning; in the afternoon; in the evening?" Again, this helps the participant to remember more clearly.
4. Several times during the interview, remind the participant to think about all physical activities including work, household, and leisure/sport activities.
5. Count walking that is done for at least 10 minutes continuously. However, for the activity to be counted it must add up to at least 10 minutes in one intensity category during a limited time segment of the day.
6. At the end of the interview, ask the participant if he/she forgot any activities.
7. The interviewer should not guess what intensity an activity is. Have the participant classify all activities into intensity categories. They should use the rule: running is ***very hard***, brisk walking is ***moderate***, and ***hard*** is in between.
8. The purpose of the PAR is to estimate energy expenditure, so an activity does not have to be continuous to be coded. If their activities add up to at least 10 minutes in one intensity category (e.g., hard) for one segment of the day (e.g., Wednesday afternoon), then that activity or those activities should be counted. For example, consider 60 minutes of gardening which included both digging and planting. If the participant alternately dug and stopped to plant in five minute intervals, this activity would be recorded as 30 minutes of digging. and would qualify as ***hard*** activity. If 10 minutes of activity is spread out over two or more segments of the day, it is not counted. For example, 5 minutes of walking in the morning, 5 minutes in the afternoon and 5 minutes in the evening do not qualify. This rule allows the interviewer to code sporadic activities, but it does not force one to code every single minute of activity during the day, which would be too time consuming.
9. Weekend days should be marked with a "squiggly" line down the column.
10. If the participant offers information about sexual activities, the interviewer should offer his or her thanks, but the activity should not be recorded.

However, do not make a point with the participant that the activity won't be recorded.

M. Certification and Quality Control Monitoring

Interviewer certification and continuous quality control monitoring of PAR measurement is critical to ACT primarily due to the fact that physical activity is a primary outcome variable and as such reduction of variance is most important. It is suggested that a minimum of three certified PAR interviewers be available at each Clinical Center throughout the course of the study. There are three stages of interviewer certification and quality control monitoring used in ACT.

1. Initial interviewer certification.

Prior to conducting physical activity recall interviews for ACT, relevant staff will be required to be certified in the interview procedure. During initial training for PAR measurement, this certification will require the following steps:

a. A personal review of ACT PAR audio tape containing sample 7-day PAR interviews.

b. Attendance in a four hour training session led by a qualified individual experienced in PAR administration. This session will include practice sessions in which the interviewer has the opportunity for administering at least three practice PAR interviews under the supervision of the instructor. The instructor will provide appropriate feedback and guidance.

c. Personal review by qualified instructor.

2. Initial certification during course of study.

For those individuals unable to attend the initial PAR training sessions conducted at Bowman Gray School of Medicine in August 1995, and those who join the study team while the study is occurring, opportunities at individual

Clinical Centers will be provided for PAR interviewer certification. There are four stages to this decentralized approach to certification:

a. A personal review of ACT PAR audio tape containing sample 7-day PAR interviews.

b. Attendance in a four hour training session led by a qualified individual experienced in PAR administration. This session will include practice sessions in which the interviewer has the opportunity for administering at least three practice PAR interviews under the supervision of the instructor. The instructor will provide appropriate feedback and guidance.

c. Opportunity to view ACT PAR video tape containing initial PAR training sessions conducted at Bowman Gray School of Medicine in August 1995.

d. Personal review by qualified instructor via telephone. In this last stage of certification, a telephone appointment will be made with Laura Becker at the Dallas Clinical Center. During the phone call, the interviewer will conduct two standardized practice physical activity interviews under supervision. Feedback will be provided and, upon completion, the interviewer will be certified.

3. Recertification and monitoring.

To minimize "interviewer drift", all certified PAR interviewers will be monitored for quality control. At six month intervals, each Clinical Center will be visited by Laura Becker or equivalent for observation and monitoring of PAR interviews. Each interviewer will be observed on three separate interviews and provided feedback where necessary. Scheduling of recertification and monitoring visits will occur on a site-by-site basis. Upon successful completion of the visit, feedback will be provided and the interviewer will be recertified.

Appendix F

Activity Counseling Trial

7-day Physical Activity Assessment Appendix

Sample 7-day Physical Activity Recall Sc ipt

Sample Instructor's Training Outline

Interviewer Certification and Evaluation form

Interview Form

Worksheet

Ainsworth, et al. Compendium of Physical Activities: classification of energy costs of human physical activities. Medicine and Science in Sports Exercise 1993;25:71-80.

Appendix F

Activity Counseling Trial

7 Day Physical Activity Recall Questionnaire
Interviewer Script

Note to the interviewer: This script is provided to help in the administration of the 7 Day Physical Activity Recall for the Activity Counseling Trial (ACT). While you do not need to memorize this script word for word, you should become familiar with it to closely follow along. For the most part, this script only contains what you should say to the participant. Instructions in coding the information and recording it on the 7 Day Recall form are included in the Manual of Operations (MOP). Interviewer Tips and Probing Tips are included at the end of this script.

Instructions in parentheses ( ) are for the interviewer and are not part of the script to the participant.

(Complete participant information in the shaded area on each page and label worksheet with days of the week from yesterday to one week ago, prior to starting the interview.)

(Page 1)

"Hi, (Participant's name)_____. We're going to do a 7 day physical activity recall together. We'll go over the last seven days and what you actually did during those days."

"There are three intensity levels that we want to talk about. The first one is ***moderate*** intensity physical activity. Here are some examples of ***moderate*** intensity activities (show laminated card). These would all be about the same intensity as going on a brisk walk."

"The next level is ***hard*** intensity activity, and here are some examples of ***hard*** intensity activities (show laminated card). This would be activity that's a little harder than going on a brisk walk, but not quite as hard as running."

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"The last intensity level is ***very hard*** intensity activity. Here are some examples of ***very hard*** intensity activities (show laminated card). These would all be about the same intensity as running."

"Remember, these are just examples, so some of the activities you do that are ***moderate***, ***hard***, or ***very hard*** may not be listed on these cards. If you have any questions about how to rate an activity just ask me. A lot of the activities you do are considered ***light*** intensity activities, which are less than ***moderate*** intensity activities, so you won't have to report those activities."

"We're also going to break the day up into 3 general time segments. Morning is usually considered from the time you get out of bed until the time you have lunch. Afternoon is the time after lunch, but before dinner, and evening is the time from dinner until the time you get in the bed. Remember, these are just general guidelines that work for most people."

"Let's start first with some questions about work."

"Were you employed in the last seven days? This includes paid work and volunteer work."

"How many days of the last seven did you work?"

"How many total hours did you work in the last seven days?"

"What days of the week do you consider to be your weekend or non-work days? For most people this would be Saturday and Sunday but it may be different for you."

(If work days + non-work days do not total 7) "What was the reason why you worked less days this past week?"

"For the past seven days, and thinking only about activities that are ***at least moderate*** intensity (point to cards). How many days did you do activity or exercise that added up to at least 30 minutes each day?"

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(Page 2)

"Let's talk now about your sleeping habits over the last seven days. On those weeknights did you get in bed and get out of bed at the same time or did it vary?" (Remember for recording purposes, weeknights are the nights before a weekday. Example: if weekdays are Monday - Friday, the weeknights are Sunday - Thursday.)

> Participant says "About the same every night." "OK, what time was it that you got in the bed? What time did you get out of the bed? Did you have any unusual weekdays when you got in bed or out of bed earlier or later? Let's go back to (most recent weekend night). What time did you get in bed on (most recent weekend night) night? What time did you get out of bed on (weekend morning)? How about on (next recent weekend night)? What time did you get in bed? What time did you get out of bed on (morning of next weekend night)?"
>
> Participant says "They vary." "OK, let's think back on last night getting up this morning. What time did you get in the bed last night? What time did you get out of the bed this morning? Let's think back on (night before last) what time was it that you got in the bed? What time did you get out of the bed (yesterday) morning? Repeat by going backwards through the last 7 nights."

"Did you take any naps or lay down for any period of time during the last 7 days?"

"Now we're going to talk about your ***moderate*** (point to card), ***hard*** (point to card), and ***very hard*** (point to card) activities for the last week."

"Let's think back on yesterday, which was (yesterday). On yesterday morning, from the time you got out of the bed until the time you had lunch, did you do anything you would consider ***moderate, hard*** or ***very hard***?"

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"How about yesterday afternoon, from the time you had lunch until the time you had dinner?"

"What about last evening, from the time you had dinner until the time you got in the bed. Anything ***moderate, hard,*** or ***very hard***?"

(Continue working backward for each day of the week, making sure you prompt them often as to the day of the week and the segment of the day being discussed).

"Are there any activities you did during the last week that might be ***moderate, hard,*** or ***very hard*** that we've not already talked about?"

(Page 3)

"Was this a typical week in terms of your usual pattern of activity or exercise?"

(If "No") "Were you more or less active in the past week than you usually are?"

"Up to now, we've just been talking about the last 7 days. Now, I'd like you to think about your usual activities over the last three months."

"During your work week, on average, how many hours per day do you spend sitting quietly? That would be like if you sit to watch TV, work at a desk or computer, eat or read."

"During your weekend, on average, how many hours per day do you spend sitting quietly?"

"How many flights of stairs do you climb up each day? A flight is 10 steps."

"If you had to add together the total minutes you spend walking during the day, how many minutes would that be? Remember, add up your actual walking time and don't add in the time

spent just standing. Include your to and from walking and any fitness walking. Don't try to remember every step, just give a general idea of the time spent walking."

"What is your usual pace of walking? Is it casual or strolling, average or normal, fairly brisk, or brisk or striding?"

"Do you regularly do strength and flexibility exercises like sit-ups, pushups, yoga or stretching?"

"How many days per week do you do these exercises?"

"On the days that you do strength and flexibility exercises, how many minutes do you spend doing them?"

"That's the end of this questionnaire, (participant name)." (Explain to participant what they will be doing next in the clinic visit).

Interviewer Tips:

- Participant says this wasn't a typical week, doesn't want to do recall on past week, or says information won't be valid. Tell participant there will be a question at the end of the questionnaire where we can note that it wasn't a typical week.
- If participant isn't putting effort into the recall, take a different approach. Think back on (next day of the week) what did you get up and do on (next day of the week)? When the participant starts to put more effort into the recall, switch back to asking about anything ***moderate***, ***hard*** or ***very hard*** during each segment of the day.
- Always get the participant to compare their activity to walking, running, or in between walking and running.
- If the participant asks how an activity is classified, get as much information about the activity as possible and then tell them how it is usually classified.
- Assure the participant that it is all right to change answers or add forgotten items to the recall.

- Some participants will be ashamed or embarrassed of low activity levels. Assure them that different people have different activity levels.
- Some participants will apologize profusely if the interviewer has to erase or change an answer that has been given. Tell them that's why we do the interview in pencil and it's more important to get it right.
- Use cues that the participant may have provided during the interview to prompt their memories. If the participant just can't remember, go to the next time segment and at the end of the recall ask again about the missing time segment.
- Put zeros on the worksheet to indicate that no moderate, hard, or very hard activity was performed.
- Use Probing Tips to get complete information on an activity, its intensity, and duration.

Probing Tips:

- Get as much detail about an activity, its duration and its intensity as possible without exhausting the participant or getting bogged down.
- When a participant reports an activity, ask if they consider it ***moderate***, ***hard***, or ***very hard***.
- Remember to liken ***moderate*** activity to going on a brisk walk. ***Hard*** activity is more than a brisk walk but not quite running. ***Very hard*** activity is the same intensity as running.
- Use the laminated cards to help classify activities.
- Ask "How long did you spend in that activity?", "Did you take any breaks?", "Were you working at the same intensity level for the whole time?". Try and determine as closely as possible the actual time spent in an activity.
- If you're unsure of what comprises an activity (i.e., yardwork). Ask the participant to tell you the details of the activity. Determine which activities are ***moderate***, ***hard***, or ***very hard*** and record individual times in correct intensity categories.
- If you are unsure about how to classify an activity, refer to the Compendium of Physical Activities by Ainsworth, et al. (Manual of Operations). If you need further help, call Laura Becker in Dallas at (214) 701-8001.

- The participant might report that this was a typical week for their pattern of activity. If the recall reflects some unusual activity (i.e., moving an office, cleaning the garage), ask the participant if they normally do _(unusual activity)_ or something equal to that activity every week. If they answer 'no', then the past week was not a typical week. If they say 'yes' then the past seven days were typical.
- Make sure that the participant is including all their waking time to calculate sitting time. For their work week, ask them if the answer they give includes time sitting before work and after work.
- Look for facial clues for signs of boredom, confusion, misunderstanding and adjust the interview accordingly.
- Listen attentively, things the interviewer hears at the first of the recall can be used to aid in the activity recall.
- Control the interview. It needs to be long enough to get the correct information, but not so long that time is wasted in meaningless conversation or useless details.
- Don't try to hide the recall form from the participant, but adopt a casual manner where the participant does not see the completed worksheet.
- Use a calendar to help the participant keep the days straight. If they have brought their own calendar they can use it to help them. Don't openly encourage participants to bring their calendars prior to a 7 day recall.

Appendix F

General techniques for interviewing

Presented below are general interviewing techniques. Specific issues regarding the 7-day PAR interview and solutions to a variety of problems are offered at the end of the Interviewer Script found in this manual.

I. HOW TO GET SATISFACTORY ANSWERS

A. ***Learn the Purpose of Each Question***. In order to do a good job of interviewing, you need to understand the kind of information we are trying to get through each particular questions. Unless you understand its purpose, you will not be able to judge when response is adequate and when you must probe for clarification or for additional information.

B. ***Don't Attempt to Interpret/Explain the Question - Maintain Neutrality***. If a participant does not seem to understand a question, repeat the question slowly and clearly. Give the participant time to think about the question (while simultaneously being aware of time allowed for administering the questionnaire). Unless you have other instructions about handling specific questions, the acceptable reply for a participant who wants to know what a question means is "whatever it means to you". Do not attempt to explain the purpose of a question unless the interviewer instructions specifically authorize you to do so.

C. ***Don't Leave a Question Until You Have an Adequate Answer or Have Determined That a Participant Can't Give a Clearer Answer***.

II. PROBING TECHNIQUES

The two most effective neutral probes are silence and repeating the original question.

A. ***Silence***. The value of silence cannot be overestimated. Many people, including interviewers, react to silence as a vacuum that must be filled with constant chatter. The interviewer who can wait quietly and patiently will soon find that 15 seconds of silence is more that most participants can take, and the participant will often expand or clarify a previously inadequate answer.

B. ***Repeat the Question or Answer Categories.*** Be sure to repeat the question as stated in the questionnaire. This is particularly useful when the participant answers a question irrelevantly. In some cases it will be necessary to remind the participant of your frame of reference, I.E. to acknowledge what the participant has said and then bring the participant back to the topic by repeating the question.

C. ***Do not Accept a "Don't Know" Answer Without Probing at Least Once.*** If a response is a "don't know", probe by asking: "Well, what do you think?" or "I'd like to know your opinion" (if the question asks for an opinion rather than facts). If the question deals with facts, we prefer an approximation to no answer at all, and you might probe "what's your best guess?" or "approximately?" to convey the idea that 100% accuracy is not required.

D. ***Use Neutral Probes That Do Not Suggest Answers.*** Probes are needed to obtain more complete, accurate answers. All probes must be non-directive, i.e., the probe must not suggest any particular answer to the participant. Probes should be used whenever the participant is hesitant in answering questions; when he/she seems to have trouble expressing him/herself; when he/she seems too shy to speak at length; whenever there is any reason for the interviewer to believe that the participant has not given a complete report of his/her thoughts; and finally, reassuring probes are needed when a participant seems to lack confidence.

E. ***Examples of Other Neutral Probes***:

1. In what way?
2. What is that? Why do you feel that way?
3. How do you mean?
4. I would like your impression.
5. I would like you opinion.
6. What do you think?
7. Can you give me an example? or For example?
8. Can you explain that in a little more detail?
9. How are you using the term...?
10. How is that? or How does that work?

11. Anything at all - even little things?
12. If you had to choose, which would you say?
13. What else can you tell me about that?
14. In general, overall...

1. Generally Speaking, Some Probes are Avoided in Favor of others.
   a. Instead of "anything else?" you'll find that "what else can you tell me about that?" is more likely to elicit answers.
   b. Instead of "why?" you'll find "why do you feel that way?" or I'd be interested in your reasons" accomplishes the same purpose and is less likely to be threatening.
2. Questions Used in Ordinary Conversation Should be Avoided Because They Suggest Answers
   a. Refrain from asking "do you mean A or B". This suggests two possible answers and there may be others which may occur to the participant.

F. ***Do Not Leave a Probe Dangling***. Always record the response to a probe even if it's only "no" or "That's all I can think of".

G. ***Always Cross Reference***. When you probe to clarify a response, always indicate which response you are clarifying. There will be times when a participant will say something ambiguous and continue talking.
   1. If there's not enough space to record the respondent's answer, use the margin. Be sure to label these continuations clearly when you edit each completed interview.
   2. Don't ask "do you mean..." People tend to say "yes" to any suggestion either because it's easy or because they think it's the right answer.

Appendix F

Page 2, Worksheet:

- Fill in blanks at top of worksheet with appropriate days of the week.
- To save time, write in times spent sleeping above the dotted line in the boxes labeled "sleep". You can figure hours spent sleeping each night after the recall is over.

Sleep	
	:

- Count only activity that is either performed continuously for 10 minutes or intermittently for a total of 10 minutes. Intermittent activity should be performed within a limited period of time (this will vary with circumstance). Example: Hard intensity gardening interspersed with light intensity gardening. Don't count time spent in light activity, but do count time accumulated in hard intensity activity. Example: Walking briskly from the parking garage at the beginning of the workday for 6 minutes and walking briskly back at lunchtime for 6 minutes with light activity in between the two walks. This would not count as moderate intensity activity since it is likely that 3 or more hours elapsed between the walks.
- Write down the activity performed above the dotted line in each cell and the total time the activity was performed below the dotted line in each cell. Use exact hours and minutes. For example: A 3 mile walk for 47 minutes would be entered as:

Moderate	
	:

- Some areas will be gray areas. Use your common sense for coding these. If you're not sure about something call Laura Becker in Dallas.
- Don't skip around on the recall days unless a participant remembers something on a day already covered. Keep to the system of going back over the last seven days in the order they occurred.

Page 3.

Question 7.

- Probe participant if it appears they had unusual activity on their 7 day recall yet they report it was a typical week.

Question 8.

- Read transition sentence and make sure participant understands we're looking for usual behavior over the last 3 months (not just the last 7 days).

Appendix F

- Watch for **general inconsistencies** in their answers as compared with the seven day recall answers. For example· participant has told you she has a desk job but reports an average of 3 hours sitting during her workweek day for the last three months. Probe to see if this does/does not include time spent sitting at work or home.
- Ask question again for average hours during weekends spent sitting.

Question 9.

- Make sure participant is only reporting flights climbed (not up and down).
- Less than 10 steps should not be counted.

Question 10.

- Record a the participant's general idea of the total minutes per day spent walking. Again, look for **general inconsistencies** (i.e., 1 minute per day reported or 360 minutes per day reported) and try to focus the person's thinking. This is time spent walking on a typical day.

Question 11.

- Record only one usual pace of walking. If they walk at different paces for different activities ask the participant to think of their usual pace. Use mile per hour guidelines if further help is needed.

Question 12 and 13.

- If yes, ask how many days per week they perform strength and flexibility exercises. Round to the nearest day.
- If they perform strength and flexibility exercises ask how many minutes they do these exercises. The timeframe is on the days that they do the exercises, not an average for the week. If it varies by day, get a general accounting of the minutes spent. For example: Every Tuesday and Thursday = 90 minutes each day, every Monday and Wednesday = 60 minutes per day, the interviewer would record 75 minutes (an average of the 4 days). Remember, this activity is reported as their usual activities over the last three months, an exact average is not necessary.

End of questionnaire.

Thank the participant for their time. Explain what will be happening next during the clinical visit.

Exercise Adherence in Persons with Type 2 Diabetes and Relationship to Diabetes Control

by

Sarah S. Ferguson

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_____ (Title)

Date: 11-11-97

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